UNIVERSITY OF TORONTO
MEDICAL JOURNAL

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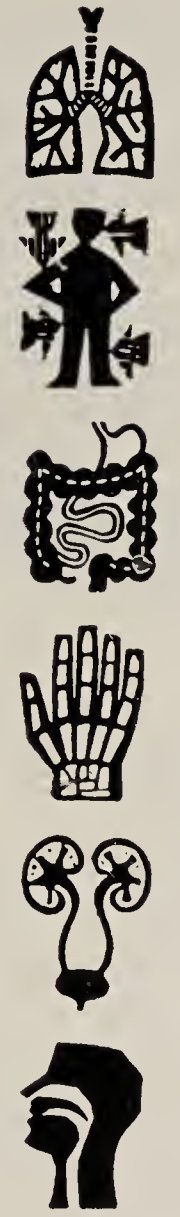

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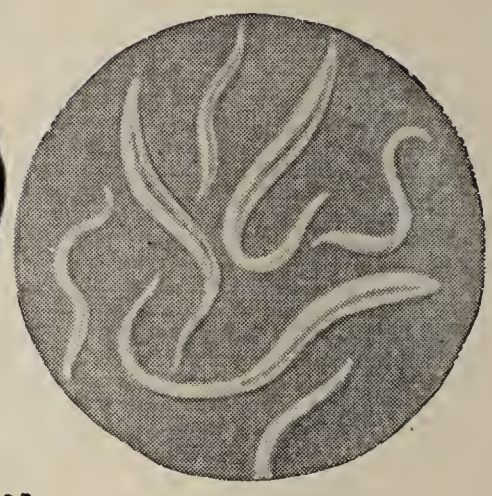

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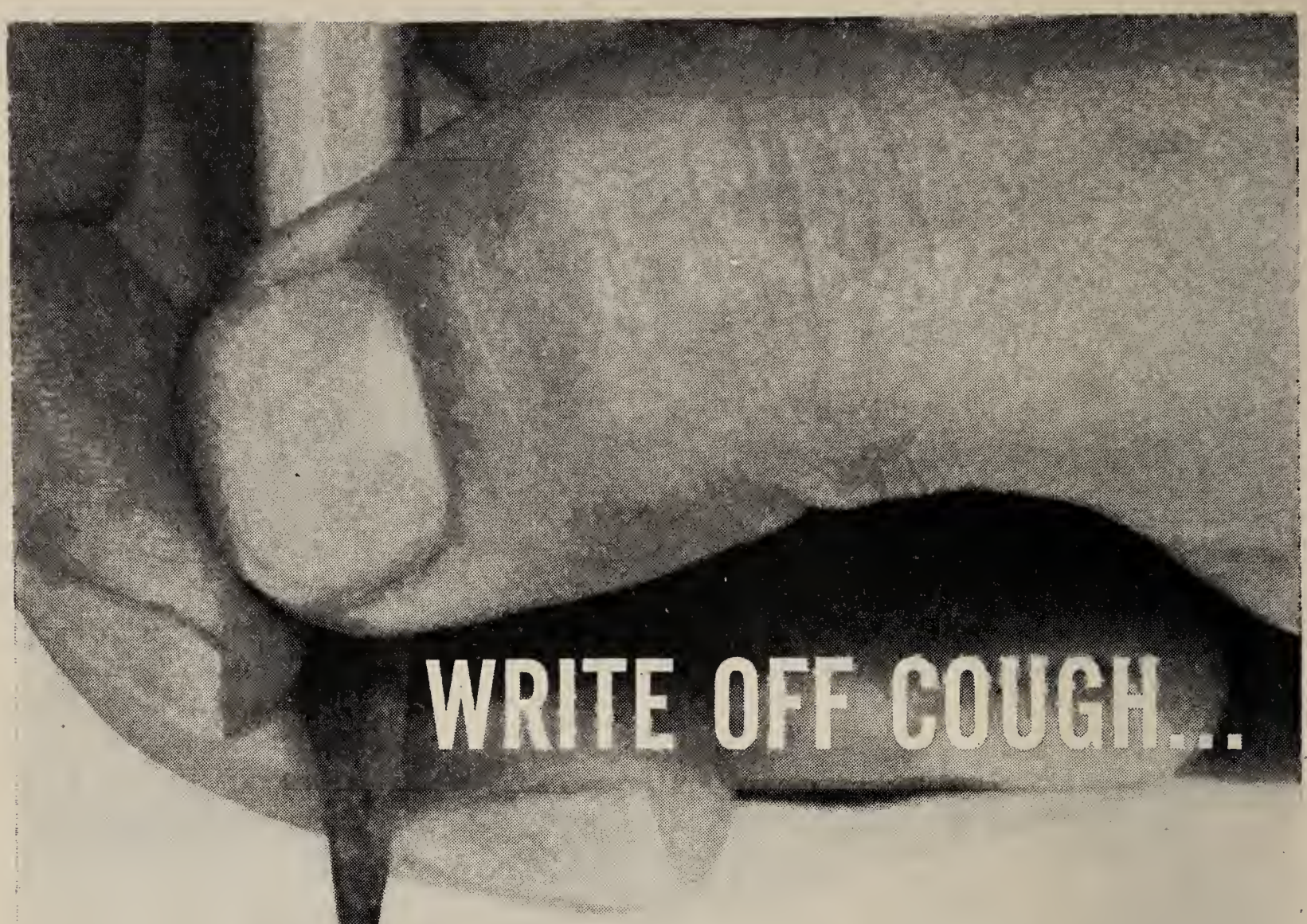

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WHAT'S IN AN EPONYM?

P. M. G. GRANT, 5T8

(The names which appear in this article are real. Only the facts have been modified.)

PROBABLY the most important single fact about any disease is its eponym.[1] Symptoms are notoriously unreliable, treatment is largely a matter of personal prejudice, but eponyms are solid, unchangeable, and vastly reassuring to both patient and practioner. Providentially, or through one of those little-understood mechanisms of natural compensation, it is those very diseases about which least is known that boast the most impressive and resounding eponyms. As a result, there are few disease conditions for which the well-tutored physician cannot suggest either a cure or an eponym. This article will concern itself with a few of the more esoteric aspects of this important, but underemphasized medical specialty. It cannot hope to cover the subject.

Many things have eponyms, but perhaps the best known and loved are those gay, motley assortments of odd findings —the syndromes. For it is written, that wheresoever two or three signs and symptoms are gathered together, there a syndrome shall be also. Syndromes can have any number of parts and any number of names. They vary in rarity,[2] from such common and well known syndromes as those of Laurence-Moon-Biedl and Detoni-Fanconi-Debré, with descriptions of which we will not insult the reader, to such exquisite rarities as the Tinker-Evers-Chance Syndrome, no case of which has ever been described. Typical of this group is the syndrome of Achard-Tiers, diabetes in a bearded woman. The diabetic on whom the original study was made belonged to a travelling circus. Like many people in that line of work, he was an impostor. A careful and complete physical examination might have suggested this to Achard and Tiers, but then who would ever have heard of them?

Fame often comes unexpectedly. Dr. Ménière, renowned for a disease and a syndrome, attained his present eminence through a fortunate accident. One day a celebrant reeled into Dr. Ménière's office, revolved several times, and fluttered gently to the floor. A bottle of Danish cherry liqueur fell from his anaesthetized fingers, and splattered all over the doctor's prized oriental rug. "Obviously", said Ménière, understandably piqued, "you suffer from vertigo. Is that your chief complaint?"

"No," said the reveller, gazing sadly at his spilled liqueur. "I've lost my heering."

No discussion of eponyms can claim to be definitive without some mention of Sir Hugh Owen Thomas, originator of the celebrated splint of the same name. Sir Hugh was the fifth son of a poor but perfectionistic Welsh wooden leg maker. His brothers Lowell, Dylan, John Charles and Thomas L. never amounted to much. Young Hugh, however, studied long and hard to master the difficult art of wooden leg making. One day, while whittling a prosthesis out of whale-bone ivory for a paranoid old sea captain whose name has not come down to us, Hugh had his revolutionary idea. Why not a wrought iron wooden leg? His father,[3] a stern traditionalist, was horrified. He booted young Hugh out of the shop with a sturdy imitation-Hepplewhite limb of his own manufacture, skilfully executed in burled walnut.

In spite of this early discouragement,

Hugh Owen Thomas' iron legs soon became so popular that wooden leg making, the chief industry of Wales, became extinct. You never hear anything about Wales any more.[4] When the Thomas splint earned its inventor a knighthood, however, his father finally forgave him. "Hugh Owen, me boy," he sobbed in his rich Welsh accent, "ye're a chip off the old block." "Father," replied Sir Hugh Owen Thomas modestly, "I'm only a splinter."

Percival Pott was a shy, sensitive lad whose early childhood, over-protected by an affectionate nanny, in no way prepared him for the psychic trauma which lay in store for him. On his first morning at Prep School, the trouble began. No sooner was his name read out at roll call than he was surrounded by ribald, juvenile, tittering. Other boys rapidly acquired nicknames; Percival was called by his surname and first initial all through Prep School, Harrow, Oxford, and Edinburgh. He never got used to it. On the surface he was calm, urbane, loftily tolerant of the daily attempts at whimsy that his name inspired. Inwardly, he lived only for the day when the name of Percival Pott would be a byword, mentioned with awe and respect among the intelligentsia of the world.

The day came, of course. Pott's Fracture, Pott's Puffy Tumour, Pott's Disease of the Spine and Pott's Operation are known and revered throughout the civilized world today. And wherever the name of Sir Percival Pott is mentioned, there is ribald, juvenile tittering. Makes you wonder, doesn't it?

The serious student of eponyms will have been struck by the frequency with which the name "Marie" appears in the literature. "Who", he may well have had occasion to ask himself, "was this Marie?" Marie, whose last name, like Nana's, remains a matter of conjecture, was a fashionable Parisian demimondaine whose charm, intelligence, and vivacity won her a place in the hearts of all the gallant young medical men at the old Sorbonne. A spirit of keen but friendly rivalry grew up among them; they vied for her favour by describing new and exotic diseases to which they would lovingly affix her name.

But among these gay, mercurial Frenchmen there was another doctor, an intense, arrogant young Prussian nobleman, a graduate of Heidelberg, within whose cropped cortex dwelt a fierce, unrequited passion for Marie. She toyed with him, as with all her admirers, and he mistook her Gallic good nature for a sincere regard.

One evening, as the infatuated young Junker worked late in his laboratory, he was interrupted by the entrance of two colleagues, Dr. Charcot and Dr. Tooth. They had obviously been roistering. "Ah, Von Recklinghausen," cried Charcot. "What are you doing in this broken down joint?" "Tell him", said Tooth (who later invented molar lactate), "what we have just done!" They had won Marie's consent to join her name with theirs, in a new and extremely rare disease. Von Recklinghausen's duelling scar turned purple with rage.[5] Maddened by his desire for revenge, he rapidly described a disease which he entitled "Marie-Strumpell". Marie was pleased by what she took to be another pretty compliment, until a travelled acquaintance told her that "strumpell", a low German epithet, can be translated (loosely) as "woman of easy virtue". She never spoke to Von Recklinghausen again.

Alas, not all eponyms are attended by such gothic and romantic emotions. Indeed, considerable pettiness and bickering have marked the birth of some of our greatest diseases. It was on a cold November morning, early in 1683, that two famous clinicians, hurrying from opposite directions, collided in the door-

way of the French Academy of Medicine. Each carried a brown paper parcel; each parcel contained a liver; each liver was hard and irregularly nodular. "I", announced the first clinician, a Dr. Portal, "have discovered a disease." "I, too," replied Dr. René Théophile Hyacinthe Laennec (for it was he), "have discovered a disease." Imagine the astonishment of the two gentlemen, on discovering that they had both discovered the same disease! "I think", observed Portal, "that it should be called 'Portal's Cirrhosis'." "Not a bad name," Laennec agreed, "but don't you think 'Laennec's Cirrhosis' has a certain je ne sais quoi?" The two discussed the matter, courteously at first, but finally growing impatient. "Ma Foie!" cried Laennec at last. "If you have a fault, it is your insufferable vanity." "I?" shouted Portal, livid with rage. "Portal, vain?"

As a matter of strict historical fact, the condition under discussion had already been described among the South-west African Bantu by Dr. Banti. Or it may have been the other way round; it's not too important. These tribesmen were observed to develop fibrotic livers and distended spleens after the ingestion of missionaries, many of whom were Benedictine, and went delectably with equal portions of brandy. Eating them was an understandable error in semantics; they had introduced themselves as "friars".

In recent years, the art and science of eponymology has shown saddening indications of decline. Not only do some scoff at the use of eponyms as name-dropping, but others go so far as to suggest that the names should be dropped permanently. If this happens, it will be a pity, both for today's eponym-lovers, who collect them like match-folders and spend enraptured hours swapping them with each other over sandwiches and coffee, and for tomorrow's medical discoverers, who face the threat of anonymity. Unless a means of rewarding future achievement is assured, doctors may lose interest in finding new diseases, and we shall all be forced to struggle along with the old ones.

Perhaps a solution can be found among the examples of Classical Antiquity. When Scipio distinguished himself in Africa, the Roman Senate, realizing full well that naming Africa after Scipio could only lead to bitterness and confusion, wisely named Scipio after Africa. Perhaps the same moderate approach can be applied here. Honour and lasting recognition could be conferred on deserving medical men by naming them after diseases.

Notes

1. Whom it's named after.
2. Rarity is classified: "common, not uncommon, uncommon, not rare, not unrare, rare, very rare, extremely rare and unheard of."
3. Thomas Thomas, who gave his name to a musical instrument widely used by Indians.
4. Unless you persist in reading books about paranoid old sea captains.
5. "No student at Heidelberg will be allowed to write his final examinations who has not assisted at twenty deliveries, performed 500 urinalyses, attended 80% of lectures and laboratory periods and fought at least one duel." Otto Von Anlagen, Dean.

PROTRUSIONS OF LUMBAR INTERVERTEBRAL DISCS

M. M. FISHER, 5T8

Introduction

IT is well recognized that permanent protrusion of disc substance may occur in any direction and in any region of the spine. The clinically significant protrusions, however, occur posteriorly into the spinal canal and this article will deal only with protrusions so directed and only in the lumbar region. Brief mention will also be made of vertical protrusions of disc substance.

To help clarify the somewhat careless terminology on the subject, "protrusion" is used in a general sense referring to a displacement of disc substance, be that merely a bulging of the intact annulus, a discal protuberance so to speak, or an actual extrusion of the nuclear substance through a break in one of its confining structures.

Anatomy

The intervertebral discs which unite the bodies of successive vertebrae form a series of joints, possessing no true joint cavities and allowing of little movement individually, especially of rotation, but of a considerable degree of movement in the aggregate. Not only does movement take place around the discs, but they also serve as bearings by which pressure can be transmitted to the adjacent vertebrae and as cushions to absorb the countless shocks of daily activity. Briefly the disc consists of a *cartilaginous plate* on each of its intervertebral surfaces, a fibrocartilaginous ring, the *annulus fibrosus*, which completely encloses and merges with the central semi-fluid mass, the *nucleus pulposus*.

Although the embryonic disc is avascular, as is the adult disc, during the early formative years blood vessels appear to penetrate the annulus and nucleus. After the age of eight years they are obliterated and scars are left, structurally weak areas which may break down under stress and permit displacement of nuclear tissue.

Multiple nerve endings, probably of pain fibres, have been demonstrated both in the posterior portion of the annulus and in the posterior longitudinal ligament.

Pathogenesis and Pathology

The premature senescence inherent in intervertebral discs together with the tremendous forces which bear upon the discs commonly cause the nucleus pulposus to protrude through its confining structures, the annulus circumferentially and the cartilaginous plates above and below. The nucleus possesses the quality of "turgescence", that is, there is a constant tendency toward displacement of the nucleus through the forces acting upon it. Normally its confines are sufficiently strong to prevent this displacement, even under conditions of great stress. But if the annulus or one of the plates is defective, the expansile quality conferred upon the nucleus will provoke a displacement of its tissue along the path of least resistance. At this point it might be well to remark that disc extrusions do not commonly occur in elderly people, the nuclear tissue of whose discs is no longer granted turgescence.

There are two points where the vast majority of nuclear protrusions occur: most commonly through the cartilaginous plates and secondly through the posterior segment of the annulus. In

protrusions through the plates, developmental defects may play a role, for the points of passage of the notochord in the embryo and of the blood vessels in the formative years are potential points of weakness. It must also be borne in mind that only thin trabeculae of spongy bone support the cartilage, and provide support extremely vulnerable to the early degenerative processes. Protrusions through the posterior annulus are common because that segment of the annulus is thinner than the anterior and lateral segments and is also less firmly attached to bone. Moreover, the posterior longitudinal ligament becomes progressively thinner and narrower as it descends the spine, offering less and less obstruction to posterior displacements of nuclear tissue. Lateral and anterior protrusions of nuclear tissue do occur, but rarely, and they will not be considered in the following analysis. There is no evidence that developmental defects play a role in the posterior protrusions, and the rarity of these lesions before the third decade lends support to this assertion.

Spurling reports that an estimated 95% of all lumbar disc extrusions seen clinically occur at the discs caudal to the fourth and fifth lumbar vertebrae, that is at the points of greatest flexibility of the spine. Most of the remainder occur at the disc caudal to the third lumbar vertebra and it is very uncommon for more than one disc to be involved. It should be appreciated, however, that degenerated unruptured bulging discs which may or may not cause symptoms, are often multiple, especially in older people. The actual protrusion of the nuclear tissue is almost always initiated by trauma, usually the trauma of everyday life. Thus nuclear turgescence, defects, congenital or acquired, in the annulus or cartilaginous plates and trauma are the main pathogenic factors involved in disc protrusion.

VERTICAL EXTRUSION INTO THE SPONGIOSA

This pathological entity was first described in 1858, but attracted little attention until Schmorl's paper appeared. In his meticulous study he found these displacements of nuclear tissue in some thirty-eight per cent of his routine autopsies, twice as frequently in males as in females under sixty years of age, where increased liability to accidental or occupational injury appears to be the determinant. The incidence was reversed in the over-sixty age group. These lesions, the so-called Schmorl's nodes, are formed by the passage of nuclear tissue, through a defect in the cartilaginous plate, into the spongy bone of the vertebral body. A traumatic factor is usually involved and, as previously suggested, developmental defects in the cartilaginous plates have been frequently incriminated.

Grossly the lesion appears as a small, firm, whitish, sharply circumscribed mass in the spongiosa of the vertebral body, usually in close proximity to the disc with which it communicates by a pedicle through a defect in the cartilaginous plate. The size of the mass varies (usually less than one centimetre in diameter) as does the shape, depending upon the trabecular resistance encountered.

In the young, reactive processes will lay down first cartilage and then bone around the intruding tissue. In the aged, vascularization and eventual cicatrization, both of the displaced tissue and of the disc are more characteristic sequelae.

POSTERIOR PROTRUSION

As suggested before, anatomical factors predispose to posterior displacement and such lesions were found in fifteen per cent of Schmorl's series. Seldom are the lesions of sufficient size to compress the spinal cord or cauda equina or even

to give rise to significant disability, and frequently they are situated in the upper lumbar and lower thoracic regions where the spinal canal is considerably larger than the part of the spinal cord which it must accommodate. The clinically significant protrusions, however, involve the lower lumbar discs, where movement is greater and room to accommodate the protruded tissue more at a premium. These lesions are found three times more frequently in males than in females, and in approximately 50 per cent of the cases there is a history of specific injury.

Usually the defect in the annulus is small, the nuclear matter apparently dissecting its way through the annulus, some of the inner fibres of which may be ruptured but whose outer fibres are more often than not intact, separated rather than fragmented. Accordingly the extrusion consists of nuclear tissue and the inner less well organized lamellae of the annulus, the outer lamellae being present only when massive rupture has occurred. Usually the loose connective tissue of the spinal canal or the outermost intact lamellae of the annulus are distended over the extruded mass. The expansions of the posterior longitudinal ligament overlie each disc, and are firmly attached to the outer annular lamellae; these account for the comparative rarity of midline protrusions. Thus the lesion appears as a bluish white mass of varying size and shape (depending on the bulk and consistency of the displaced tissue) to one side of the midline. It shines through the posterior ligament by which it is covered, and presses against the dura mater to which it may later become adherent during the organization processes.

The extruded tissue is prone to undergo various degenerative changes. Dehydration soon occurs, and the mass tends to become firmer in consistency. Invasion of fibrous tissue and blood vessels from the surrounding structures is most uncommon in patients who come to operation. These patients usually present disc tissue in various stages of calcareous and myxoid degeneration. Subsequent lipping of the vertebrae or osteophyte formation is uncommon since the posterior longitudinal ligament is but weakly attached to the vertebral bodies, and hence no marked degree of periosteal irritation is occasioned by the presence of the extruded tissue. These findings, however, are commonly seen in and are characteristic of degenerative disc disease.

Clinical Evaluation

vertical extrusion into the spongiosa

These lesions in themselves are usually symptomless, no pain fibres being involved in the displacement process. However, abnormal forces are brought to bear on the annulus, which may disintegrate under grinding pressures or bulge back to interfere with venous drainage or to compress spinal nerves. Accordingly, especially in older patients, disc deformity with narrowing of the intervertebral space may produce deformity of the spine as a whole with forward tilting of the vertebrae, and possibly osteophyte formation. Radiologically these lesions cannot be detected until the reactive processes have laid down a shell of compact bone around them, though if substantial extrusion of nuclear tissue has occurred a narrowing of the intervertebral space may be detected.

posterior displacements

Although the syndrome of lumbar pain with or without disability and pain in the distribution of the sciatic nerve has long been recognized clinically and although a posterior protrusion of disc tissue was observed as long ago as 1859, the correlation between these symptoms

and the compression of nerve roots by displaced discal tissue has only recently been established. The indefinite nature of the signs and symptoms, and their similarity to those found in various conditions (back strain, cauda equinal tumours, arthritis) often makes the diagnosis difficult. Moreover the majority of displacements are initially clinically silent. Though trauma almost always plays a role, only in the case of a large posterior protrusion into the spinal canal may the patient be able to attribute the onset of symptoms to a specific injury or strain. Not until 1934 was the syndrome clearly defined.

Sex

More than 70% of these patients are males, the influence of repeated minor trauma in occupations requiring heavy backwork.

Age

More than 70% of these patients are under forty years of age, the influence of the early degenerative processes.

Incidence

Although undoubtedly the commonest cause of low back pain, the true incidence of this lesion is unknown, for relatively few patients with these symptoms are submitted to myelographic studies or operation, and many of them go on to recovery under non-surgical management.

Symptoms

Although the disc itself may be the source of pain (the annulus is supplied with sensory nerve fibres inevitably stretched or torn in the process of protrusion) the symptoms of this condition are produced more commonly by virtue of secondary effects on the surrounding structures, the paraspinal muscles, spinal ligaments, posterior joints or nerve roots. The different types of nuclear displacement result in varied clinical and radiological pictures, often extremely difficult to interpret. The following account deals merely with that picture more commonly encountered.

1. *Low Back Pain*

This is an excruciating pain, characteristically incapacitating and experienced in the lumbar region. It may or may not be preceded by a sudden sensation of "slipping" or "catching" in that region. It is intensified by movement and by weight bearing, and is usually spondylogenic rather than neurogenic in origin. Gradually a dull aching discomfort replaces the acute pain, and eventually a partial or complete remission of symptoms is obtained. After a period of relative relief from pain, usually named in days or weeks, another acute episode is experienced, usually initiated by indirect trauma which may well be trivial. Thereafter, recurrent attacks characterize the history, a history which may go on for years. This is only a variation on the theme, and low back pain need not ever be a feature of the clinical picture.

2. *Associated Sciatic Pain*

This may have its onset simultaneously with that of the acute low back pain, but usually there are several attacks of the latter before sciatic pain ensues, and the interval may well be measured in years. In many cases of course, there is no low back component, and the patient complains only of pain and disability in the distribution of the sciatic nerve. Usually there is pain and tenderness along the entire course of the sciatic nerve with areas of increased intensity, localized according to which nerve roots are involved. This pain, often sharp and shooting in character, is also intensified with bending movements, coughing and more often than not is not relieved when a remission of the low back pain is obtained. This pain is apparently caused by a stretching or compression of the nerve root by the protruding tissue.

3. *Other Neurological Symptoms*

Localized areas of numbness and paresthesiae such as tingling are often of diagnostic significance. The latter, being produced by relatively minor degrees of pressure, are probably of more value since the variability of sensory nerve distribution and the overlapping of dermatomes render the interpretation of demonstrable sensory loss somewhat hazardous. It is noteworthy that pain is referred to the dermatomes of the affected spinal nerves at some time in almost every proved case of protruded disc. Localized palsies, such as foot-drop, occur not infrequently while sphincter disturbances are seen only with massive extrusions which completely obstruct the spinal canal.

Physical Examination

If the patient is found recumbent, his position of comfort is usually that of lying on his sound side with his affected limb flexed at the hip and knee. Unless contraindicated by neurological complications the patient must be examined, completely undressed, in a standing position and his posture, gait and general body alignment carefully observed.

In the absence of severe neurological deficit the affected limb will be flexed at its major joints with the heel slightly off the ground. A lumbar scoliosis commonly offsets the upward tilt of the pelvis on the affected side. The patient appears to list away from the side of his sciatic pain. The scoliosis is not pathognomonic, and its convexity may be directed either towards or away from the side of pain. Most significantly the lumbar paraspinal musculature, in variable degrees of spasticity, reduces, completely obliterates or even reverses the normal lumbar curve, while all movements of the spine, particularly in extension, are limited and often painful.

The above findings are manifestations of a reflex protective mechanism, established to decompress the involved nerve root. Before progressing to the special tests it should be appreciated that a herniation of the L_{4-5} disc usually spares the L_4 nerve root and compresses the L_5 root. Similarly the L_5–S_1 disc herniation usually spares the L_5 nerve root and catches the S_1 root.

Special Tests

Percussion Test

A precise point of tenderness is established by means of light percussion strokes (or digital pressure) over the spinous processes, with the spine flexed to the point where the usual back or leg pain is intensified. A deep percussion note is then made lateral to this point and on the painful side. Sharp pains radiating into the hip or down the back of the leg, that is along the course of the affected nerve root, constitute a positive test.

Jugular Compression Test

Obstruction of the venous return in the internal and external jugular veins (for at least two minutes, until the patient complains of a distinct feeling of fullness in his head), increases the pressure in the subarachnoid space, thereby producing additional tension on the involved nerve root. A positive test is recorded on the basis of increased pain, first in the back, then in hip and thigh and finally down the leg to the ankle and toes; that is, on the basis of an exaggeration of the usual pain pattern. The test is pathognomonic only of a lesion, which might well be a neoplasm, involving the nerve roots.

Sciatic Nerve Stretching Test

With the patient recumbent, his thigh flexed at right angles to his trunk, one extends the patient's leg on his thigh until he just experiences pain in the gluteal or hamstring regions. Then without moving any other parts the foot is briskly dorsiflexed. The test is positive

if the pain is increased in the course of the sciatic nerve. If the test is positive one assumes that the sciatic nerve is sensitive to a degree of stretching which would not cause pain in a normal nerve, that degree of stretching caused by the pull on the tibial nerve in the final movement of the test. This is merely a somewhat more sensitive version of the simple straight leg-raising test.

Spine Rotation Test

Intensification of nerve root pain in the leg muscles with numbness and tingling in the foot and toes during forcible lateral bending and rotation of the spine towards the painful side is more or less pathognomonic of nerve root involvement; one must first exclude spondylogenic pain during the procedure.

Motor Tests

These are of value since the segmental motor pattern appears to be somewhat more constant than that of the sensory nerves. Usually, however, only one nerve root is involved and any paresis produced is usually mild and the functional differences from the contralateral muscle group often subtle.

Although more sensitive tests are available, the following are quite adequate for routine use and may be done quickly:

(a) S_1 root

This supplies the Achilles group of calf muscles, and paresis is detected if the patient tends to drop the heel to the floor while walking briskly on his toes (provided that pain is not a factor).

(b) L_5 root

This supplies the muscles of the anterior crural compartment, that is, the dorsiflexors of the foot. Paresis is detected if the patient slaps his toes while walking on his heel or if the patient's ability to dorsiflex is feeble.

Sensory Tests

These are less reliable than the motor tests for accurate localization of the lesion because of variations in the dermatome patterns. Those patterns given in the table which follows are those most frequently encountered, but the areas are by no means constantly deficient. Pin prick and soft touch are usually sufficient for routine examination.

Reflex Testing

This is a difficult part of the examination, but the results are accurate and therefore reliable.

L_3–L_4 disc—Knee jerk usually reduced or absent due to involvement of L_4 root.

L_4–L_5 disc—Tibialis posterior tendon reflex may be reduced or absent, but the reflex is extremely difficult to elicit.

L_5–S_1 disc—Ankle jerk reduced or absent due to involvement of S_1 root. Because of its lower segmental innervation this is the most important reflex.

Radiological Examination

Routine films

AP and lateral views of the lumbosacral spine and sacrum must be taken and special films then taken of suspicious areas for spur identification, regional disc collapse and posterior subluxation. Such films may show only a reduced or eliminated lumbar lordosis, the effect of associated muscle spasm, or a thinning of the involved disc with localized hypertrophic changes on the adjacent bony margins. The most significant value of these films is probably that of settling the problems of differential diagnosis, for even with massive extrusions, the plain films are often normal.

Myelography

The use of this important diagnostic aid is limited even though it may offer the best, indeed often the only, method of examining these lesions. Usually the diagnosis is based on the clinical findings,

LOCALIZATION OF THE LESION

Test	L_{3-4} disc (L_4 root)	L_{4-5} disc (L_5 root)	L_5-S_1 disc (S_1 root)
Level at which tenderness and radiating pain are elicited in percussion test.	Spinous process of L_3	Spinous process of L_4	Spinous process of L_5
Site of tingling elicited during jugular compression test.	Mesial aspect of leg and foot	Great toe and dorsum of foot	Lateral aspect of leg, superior aspect of foot and toes 4, 5, and rarely 3
Reflexes			
Knee jerk	Reduced or absent	Normal*	Normal
Tibialis Posterior jerk	Normal	Reduced/absent	Normal
Ankle jerk	Normal	Normal*	Reduced/absent
	*One or the other may be reduced with multiple root involvement.		
Motor deficit	Weakness/atrophy of the following muscles is most significant and is regularly seen.		
	Quadriceps Femoris	Muscles of anterior compartof leg	Gastrocnemius and soleus
Sensory deficit	Hypalgesia or paraesthesiae in these areas:		
	Medial aspect of leg just below knee to dorsum of foot and perhaps medial aspect of great toe	Anterior aspect leg, dorsum of foot and great toe and perhaps portion of second toe.	Lateral aspect of leg, foot and toes 3–5 with maximum involvement in 5th

and myelography is reserved for localization purposes, first in preoperative patients and second where the neurological signs are too equivocal to permit accurate localization. It should be recognized that misleading results are still obtained in as many as 25% of cases depending on the myelographer.

DIFFERENTIAL DIAGNOSIS

Rheumatoid Spondylitis

This condition often begins in the lumbo-sacral spine or the sacroiliac joints, but the pain, which is not severe, is insidious in onset and unremittingly progressive in course, while nerve root involvement is rarely, if ever, seen. Radiologically there is an early loss of definition and later a moth-eaten appearance in the sacroiliac articulation.

Other Types of Arthritis

These include hypertrophic osteoarthritis with spur formation in and around the intervertebral foramina. Usually there is multiple joint involvement, and remissions, if they occur at all, are less clearly defined.

Traumatic Fractures of Spine and Pelvis

Diagnosis in this case is made by X-ray with deformity of vertebrae, displacement of bony fragments and no apparent loss of bony detail in the early stages.

Neoplasms

The pain of this lesion is characteristically unremitting, save in tumours of the cauda equina where the pain is often relieved by exercise. Destruction, often

associated with collapse of the vertebral bodies, is characteristic.

Spinal Anomalies

Backache may be present, but associated sciatic radiation is most uncommon. Such lesions are usually easily identified on plain films, and should provide no cause for confusion. Spondylolisthesis is the most commonly incriminated anomaly.

Infections

Radiological changes are usually promptly apparent in the discs themselves. Tuberculosis, for example, may involve the disc at a very early stage with absolutely no demonstrable change in the contiguous bone.

Management

Before surgery is considered, each patient should be given a reasonable period of conservative treatment. Complete bed rest should be instituted as soon after the onset of acute symptoms as possible. Fracture boards should be provided and this regimen maintained for four to six weeks. Local heat and massage may have a beneficially soothing effect, but manipulative exercises may be frankly harmful. Sedation should be adequate. After the acute phase of pain and spasm has subsided, a graded rehabilitation programme with corrective exercises to increase the mechanical efficiency of the patient's posture may be started. Various types of braces are available for the ambulatory patient, but these must be used with discretion to avoid weakening and atrophy of the whole musculoskeletal apparatus of the back.

If after a thorough trial of conservative measures the patient remains completely disabled by his symptoms or experiences recurring attacks or if there is a progressive impairment of motor nerve root function, then elective surgery is indicated. Such surgery is also recommended for the patient who after many years of low back pain experiences sciatic radiation for the first time. Severe neurological deficit, for example, paralyses of muscle groups or sphincter disturbances, usually indicates massive protrusion and of course necessitates immediate operation. The discotomy procedure is relatively safe with satisfactory results obtained in at least 75% of the cases. The high incidence of postoperative back pain gives cause for concern, an incidence sufficiently high to suggest that the trauma of surgery may well aggravate the damage inevitably pre-existing in the posterior joints between the vertebrae concerned. But this is a timid suggestion and should be offered to neurosurgeons only with diplomacy and tact.

The question of spinal fusion, performed at the same time as the enucleation procedure, remains unsettled. It is usually performed if there is definite evidence of back instability, if there is associated spondylolisthesis or in some patients whose livelihood depends upon hard labour. Fusion is not treatment for nerve root involvement; it is reserved for spondylogenic pain and certainly can carry no guarantee of absolute or even definite cure.

Prognosis

There are no clinical findings which enable one to prognosticate which patients will be relieved by conservative therapy and which will suffer the tortures of chronicity. The severity and duration of the ailment vary widely from case to case. A protrusion, not too massive, not too vulnerably located, may completely clear up in a matter of six to eight weeks with early and adequate management. But the next patient will suffer painful episodes of variable severity and frequency for years. Many feel

that the disease undergoes healing by natural processes in a large number of cases, and justify their conservative regimen on this basis. Most certainly, however, the normal physiological status of the disc can never be restored for the protruded tissue soon undergoes irreparable degeneration. Most surgeons find little justification for allowing the disease to run too chronic a course, for sciatica is not a common long term complaint after discotomy, and with improving techniques one hopes that the lot of these patients may soon be improved.

ACKNOWLEDGEMENT

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CONGENITAL HEART DISEASE: DIAGNOSTIC METHODS

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1. HISTORY

THE history may be considered in three parts. *Maternal history*: Rubella in the early months of pregnancy is frequently associated with a patent ductus arteriosus and sometimes with other cardiac lesions. Other viral diseases have not been proven to be etiological factors. *General history*: Feeding difficulties, failure to grow at a normal rate, rapid respiratory rate and frequent respiratory infections due to increased pulmonary blood flow are features into which enquiry should be made. *Cardiac history*: A history of limited physical activity, squatting or cyanosis is of great significance.

Squatting refers to the habit in children with certain forms of cyanotic heart disease, notably Fallot's Tetralogy, of resting on their haunches after mild exertion. It is said that the sharp flexion of the knees curtails circulation to the legs, and decreases the volume of the peripheral vascular bed causing a relative increase in circulation to the vital centres.

True cyanosis is observed best in the nail beds and the lips. It does not prove the diagnosis of heart disease, for it may occur in other conditions such as arteriovenous aneurysm and methemoglobinemia. It is a very useful point in the differential diagnosis of congenital heart disease, for it indicates the presence of an overall right to left shunt in the circulation. It cannot be caused merely by an inadequate pulmonary blood flow, as occurs in pure pulmonary stenosis, without a right to left shunt. However, if there is decreased pulmonary flow, then even a small right to left shunt can cause significant cyanosis since there is little oxygenated blood reaching the systemic circulation. The blue colour of cyanosis is due to the presence of an increased amount of reduced haemoglobin in the capillaries. At least 5 Gm. of haemoglobin per 100 cc. of blood, or one-third

of the normal 15 Gm./100 cc., must be reduced before clinical cyanosis is apparent.

The time of onset of cyanosis is important in diagnosis. For example, Fallot's Tetralogy does not show cyanosis usually for months after birth whereas in transposition of the great vessels, it is evident from birth.

2. Physical Findings

(a) *Habitus*: This often reflects the presence of, and occasionally the type of, anomaly. For example, asthenic, chronically ill children often have atrial septal defects. Severe stunting of growth often occurs in those with a widely patent ductus and robust plethoric individuals are frequently seen with coarctation of the aorta.

(b) *Associated congenital lesions*: Cataracts, nerve deafness and cerebral defects should, in a child whose mother suffered from Rubella early in pregnancy, lead the physician to suspect a patent ductus. If mongolism or arachnoidactyly are present, an interatrial septal defect or atrioventricularis communis can be suspected.

(c) *Clubbing*: This is always associated with considerable cyanosis if it is due to congenital heart disease.

(d) *Pulse*: Absence of the femoral pulse is diagnostic of coarctation of the aorta. Radial pulses are difficult to feel in aortic stenosis. One radial pulse may be absent if one of the subclavian arteries is involved in coarctation of the aorta or if the subclavian of that side has been used in the Blalock operation. Water hammer pulses are characteristic of aorto-pulmonary septal defects and patent ductus arteriosus.

(e) *Apex displacement*: If the apex beat is not at the usual site, dextrocardia must be excluded. Right heart enlargement causes lateral displacement whereas left heart enlargement causes the apex to shift down and laterally.

(f) *Thrills*: These are a manifestation of underlying murmurs, and have the same point of maximal intensity. Biphasic thrills in the first and second left interspaces indicate a patent ductus. Systolic thrills felt in the second, second and third, and fourth left interspaces usually indicate pulmonary stenosis, atrial septal defects, and ventricular septal defects respectively. Ventricular defect thrills are also characteristic over the lower sternum.

(g) *Murmurs*: The murmurs of patent ductus, pulmonary stenosis and atrial and ventricular septal defects correspond to the thrills mentioned above. Aortic stenosis also causes a systolic murmur in the second right interspace.

Functional systolic murmurs are often heard in children with normal hearts. They are musical, transient, heard best along the left sternal border, and are usually not widely transmitted, being best heard in the second interspace.

Venous hum refers to a high pitched continuous sound heard best in the upper chest beneath the clavicle. It may be obliterated by turning the head or by jugular compression, and is made worse by hyperextension of the head. These features distinguish it from the patent ductus murmur with which it is usually confused.

Diastolic murmurs are not common with congenital heart disease, but are occasionally encountered.

Continuous murmurs may be heard with a truncus arteriosus (which may have no murmur) or a pulmonary arteriovenous fistula as well as with a patent ductus.

(h) *Blood Pressure*: This is of value in the same situations as pulse determination. A resting systolic pressure over 100 mm. of mercury is abnormal in an infant or child under 5 years of age.

(i) *Hepatosplenomegaly*: The liver may normally be palpable two centimetres below the costal margin in the right nipple line until age two. Further enlargement is good evidence of cardiac failure in the presence of an enlarged heart, and is a better sign in an infant than peripheral edema or lung base rales.

Splenic enlargement is rarely caused by failure, and is an important sign of subacute bacterial endocarditis. Polycythemia in the presence of cyanosis causes splenic enlargement.

3. Fluoroscopy and Radiology

These important procedures should be undertaken with barium in the esophagus and films should be made in the oblique positions as well as the postero-anterior position. Attention should be paid to the size and contour of the heart, vascularity of the lung fields, the aortic arch and the possibility of a retro-esophageal vessel. X-ray films are necessary for confirmation.

The establishment of a provisional diagnosis on the basis of radiologic findings is as follows: If in a cyanotic patient radiology reveals a normal heart and decreased lung vascularity, then all acyanotic and such cyanotic malformations as transposition of the great vessels, truncus arteriosus and Eisenmenger's complex can be ruled out. This leaves a smaller group having in common pulmonary stenosis or atresia. These include Fallot's Tetralogy, pulmonary stenosis with interatrial communication and tricuspid atresia. Final differentiation is on the basis of other diagnostic methods.

If the cyanotic patient presents X-ray signs of heart enlargement and pulmonary engorgement, attention should be focused on transposition, Eisenmenger's or truncus arteriosus. Other radiologic features can make the diagnosis more specific.

Among the acyanotic lesions four general types of X-ray appearance are seen. Two are associated with pulmonary engorgement. In one, moderate left ventricular enlargement is present indicating an extracardiac left to right shunt. A patent ductus and an aorto-pulmonary septal defect fit these qualifications. The other group with pulmonary engorgement shows right ventricular enlargement. This indicates an intracardiac shunt from left to right. An interatrial or a large interventricular septal defect fit these qualifications.

The first of the two types of acyanotic heart disease with no pulmonary engorgement shows a normal cardiac outline as well. This situation is likely to be due to a small ventricular septal defect with only a murmur as evidence of disease. Pure pulmonary stenosis may give a similar picture, but usually there is some evidence of right ventricular hypertrophy. The second type of acyanotic heart disease without pulmonary engorgement is accompanied by left ventricular hypertrophy. These findings suggest obstruction to left ventricle outflow as found in aortic stenosis.

4. Electrocardiography

Electrocardiography is not nearly as useful in the differential diagnosis of congenital heart disease as it is in acquired heart disease. The chief use is in the determination of specific chamber hypertrophy by means of axis deviation information. Right axis deviation is normal until one year of age.

Right ventricular hypertrophy of varying degree and hence right axis deviation is usually seen in atrial and ventricular septal defects, Fallot's Tetralogy, pure pulmonary stenosis, Eisenmenger's disease, anomalous pulmonary venous drainage, truncus arteriosus and transposition of the great vessels.

Left axis deviation may be seen in

coarctation of the aorta, patent ductus arteriosus and tricuspid atresia.

5. Angiocardiography

This refers to the visualization of the heart chambers by serial roentgenograms following the injection of an iodine-containing contrast material into the circulation. Information is thus obtained regarding the size, shape and location of the individual heart chambers and great vessels. The presence of a right to left shunt is also visualized, and thus angiocardiography is especially useful in cyanotic forms of congenital heart disease.

In Tetralogy of Fallot one notes simultaneous opacification of the right ventricle and aorta due to overriding.

In pulmonary atresia (pseudo truncus arteriosus) the pulmonary artery is not opacified.

In transposition of the great vessels one sees filling of the aorta rather than the pulmonary artery from the right ventricle. A septal defect in this condition may be noted by left heart staining during right heart opacification.

In truncus arteriosus the significant finding is the large sized single vessel arising from the heart. Whether the pulmonary arteries arise from the truncus or not is readily observable.

In tricuspid atresia the right and left atria fill almost simultaneously, and both are dilated. Almost immediately after, left ventricle filling occurs preceding right ventricle or pulmonary filling. This is diagnostic.

6. Retrograde Thoracic Aortography

Ordinary angiocardiography does not usually achieve sufficient concentration of dye in the aorta to be of use in showing coarctation or patent ductus arteriosus. In order to obviate this difficulty direct retrograde injection of dye into the systemic circulation is performed. The brachial artery is a good site for injection. This technique is valuable for showing the presence of aorto-pulmonary septal defects as well as coarctation and patent ductus.

7. Cardiac Catheterization

This procedure may yield information in several ways. The first is to show abnormal pressure relationships in the venae cavae, right atrium, right ventricle and pulmonary artery. In isolated pulmonary stenosis the right ventricular pressure is high, but that in the pulmonary artery is lower than normal.

A second way catheterization can give information is by analysis of suitable blood samples for oxygen content. Left to right shunts show higher than normal oxygen contents in the right heart chambers or pulmonary artery depending on the site of the shunt. By means of various formulas the size of the shunt can be calculated. Atrial and ventricular septal defects as well as patent ductus arteriosus can be diagnosed in this manner.

Thirdly, conclusive evidence of the presence and location of a shunt can be obtained if the catheter passes directly through an abnormal communication. This may occur in septal defects or patent ductus.

It should be realized that the last three diagnostic methods are by no means free of danger, and should only be undertaken if all else is inadequate to establish a diagnosis.

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HEADACHE

G. M. URBACH, 5T8

Definition

INTERPRETED literally headache means ache or pain located anywhere in the head, but its meaning has been narrowed by long usage to signify ache or pain experienced in the region of the cranial vault.

Etiology

A. general considerations

In order to analyse the factors which produce and influence headache, it is essential to know the structures of the head which are, or are not, sensitive to pain.

Of the tissues covering the cranium, all are more or less sensitive to pain, the arteries being especially so.

Of the intracranial structures, the great venous sinuses and their venous tributaries from the surface of the brain; parts of the dura at the base; the dural arteries and the cerebral arteries at the base of the brain; the 5th, 9th and 10th cranial nerves and the upper three cervical nerves are sensitive to pain.

The cranium (including the diploic and emissary veins), the parenchyma of the brain, most of the dura, most of the pia and arachnoid, the ependymal lining of the ventricles, and the choroid plexus are *not* sensitive to pain.

B. changes in intracranial pressure

In the normal human subject, headache can be induced by the drainage of 20 cc. of cerebrospinal fluid with a lumbar needle. This headache can be alleviated not only by the intrathecal injection of saline and the restoration of cerebrospinal fluid volume, but also by tilting toward the horizontal or simply by head flexion or extension.

Elevation of the intracranial pressure in the normal human subject to abnormally high levels fails to cause headache, and yet in the case of a tumour where the general rise in pressure is not great, a headache is produced.

One can therefore conclude that headache associated with either decreased or increased intracranial pressure results from the traction upon, or displacement of, pain sensitive intracranial structures, and is independent of generalized intracranial pressure change *per se*.

C. mechanisms of pain production

With respect to their origin, headaches fall into two major categories:

(1) Those that occur on stimulation of tissues on the outside of, and adjacent to, the skull. This may be caused by periosteal irritation, vascular disturbances, or nerve irritation either directly, as in the case of herpes, or indirectly from the eye, middle ear, nasal sinuses or oral cavity.

(2) Those which arise mainly as a result of stimulation of intracranial structures. These may be caused by:

a. Traction on veins which pass to

venous sinuses from the surface of the brain or displacement of the great venous sinuses.

b. Traction on the middle meningeal artery.

c. Traction on the large arteries at the base of the brain or on their main branches.

d. Distension and dilatation of the internal carotid artery.

e. Inflammation in or about any pain sensitive structure of the head.

f. Direct pressure by tumours on cranial or cervical nerves which contain pain afferent fibres from the head.

Stimulation of pain sensitive intracranial structures on or above the superior surface of the tentorium cerebelli results in pain in various regions in front of a line drawn vertically from the ears across the top of the head. The pathways for the pain are contained in the 5th cranial nerve.

Stimulation of pain sensitive structures below the inferior surface of the tentorium cerebelli results in pain behind this line. The pathways of this pain are contained in the 9th and 10th cranial nerves and in the upper three cervical nerves.

Classification

I. Organic Disease

A. *Intracranial*

(1) *Expanding Lesions*

(i) Brain tumour: The headache is mild to moderately severe. It may be localized or generalized. It is generally intermittent, but may be constant.

(ii) Brain abscess: As above.

(iii) Subdural haematoma: As above.

(2) *Meningeal Irritation*

(i) Acute meningitis: The headache is constant, severe, generalized, throbbing or bursting. It is associated with hyperalgesia of the scalp and radiates down the neck.

(ii) Chronic meningitis (tuberculosis or syphilis): The headache is severe to dull, and may be generalized or over the vertex.

(iii) Subarachnoid haemorrhage: The headache is sudden in onset, severe and constant.

B. *Cranial*

(1) Paget's Disease: The headache is severe with a burning type of pain. It may be intermittent or constant, and is localized or generalized.

(2) Neoplasms: As above.

C. *Extracranial*

(1) Sensory nerve of the scalp: The headache is paroxysmal and radiates along the course of the nerve, which is tender on pressure. The pain of herpes may be constant.

(2) *Referred*

(i) Eye (eyestrain, iritis, glaucoma): The headache is frontal or supraorbital. There is moderately dull pain, but it may be severe. It is frequently worse after the use of the eye.

(ii) Middle ear (otitis media, mastoiditis): The headache is temporal, unilateral, intermittent and has a stabbing sensation.

(iii) Nasal sinuses: The headache is frontal and may be dull or severe. It is worse in the morning and improves in the afternoon. It is made worse by cold, damp weather.

(iv) Oral cavity (teeth, tongue, pharynx): The headache may be unilateral or bi-

lateral. Its intensity varies. It is periodic, and may be accompanied by pain in the mouth, jaw or throat.

D. *Vascular Disturbances*

(1) Migraine: The headache begins as a boring pain in a localized area on one side, and gradually spreads until the whole of one side of the head is involved. It is usually unilateral, but may be bilateral. The headache is on the side opposite to that of the prodromal symptoms (scintillating scotomas, hemianopsia, paraesthesia). It gradually increases in intensity, and acquires a throbbing character. It is intensified by stooping and by all forms of exertion. Anorexia, nausea and vomiting generally accompany the headache.

(2) Toxic States (including infections, alcoholism and uraemia): The headache is severe, generalized, pounding and constant.

(3) Hypertension: The headache is throbbing or bursting, paroxysmal, generalized or over the vertex. It is not directly related to the height of the blood pressure, but to the degree of stretch evoked at the cranial arteries.

(4) Histamine: The headache is unilateral and severe. It involves the eye, temple, neck and face.

II. POST-TRAUMATIC

The headache may be localized to the site of injury or generalized. It is variable in intensity, frequency and duration. It is made worse by emotional disturbances.

III. PSYCHOGENIC

The headache may be any type but is frequently bizarre. The commonest is a sense of pressure at the vertex, frequently encountered in anxiety states. One source of anxiety headache is the persistent contraction of the frontalis muscle. Persistent neurolgic pains associated with hyperaesthesia of the scalp and failing to respond to all analgesics may be encountered in hysteria. Patients suffering from depressive states sometimes describe a "terrible pain in the head" of which they can give no more precise description. A feeling of tightness or pressure at the back of the neck may also be psychogenic. Psychogenic headaches are generally constant, made worse by emotional disturbances and described in superlative terms.

INCIDENCE

An accurate picture of the incidence of the different types of headaches is difficult to obtain because it varies to a large extent with the type of patient seen by the investigator. Reilly[1] mentions figures obtained from a neurologist, an oculist and a rhinologist. They were as follows:

Neurologist:	Neurasthenic	45%
	Hysteric	6%
	Organic	17%
	Gastrointestinal	19%
	Diseases of special senses	13%
Oculist:	Eye strain	75%
Rhinologist:	Nasalpathology	40–60%

TREATMENT

Apart from palliative treatment with analgesics which can safely be used in most cases, the treatment of a headache is that of the causal disorder.

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On Inspection:

Careful observation often makes a diagnosis without the physician laying a hand or an instrument upon his patient. Here are six photographs to test your powers of observation. Each has enough clues for you to make the diagnosis.

You will find the answers on page 158.

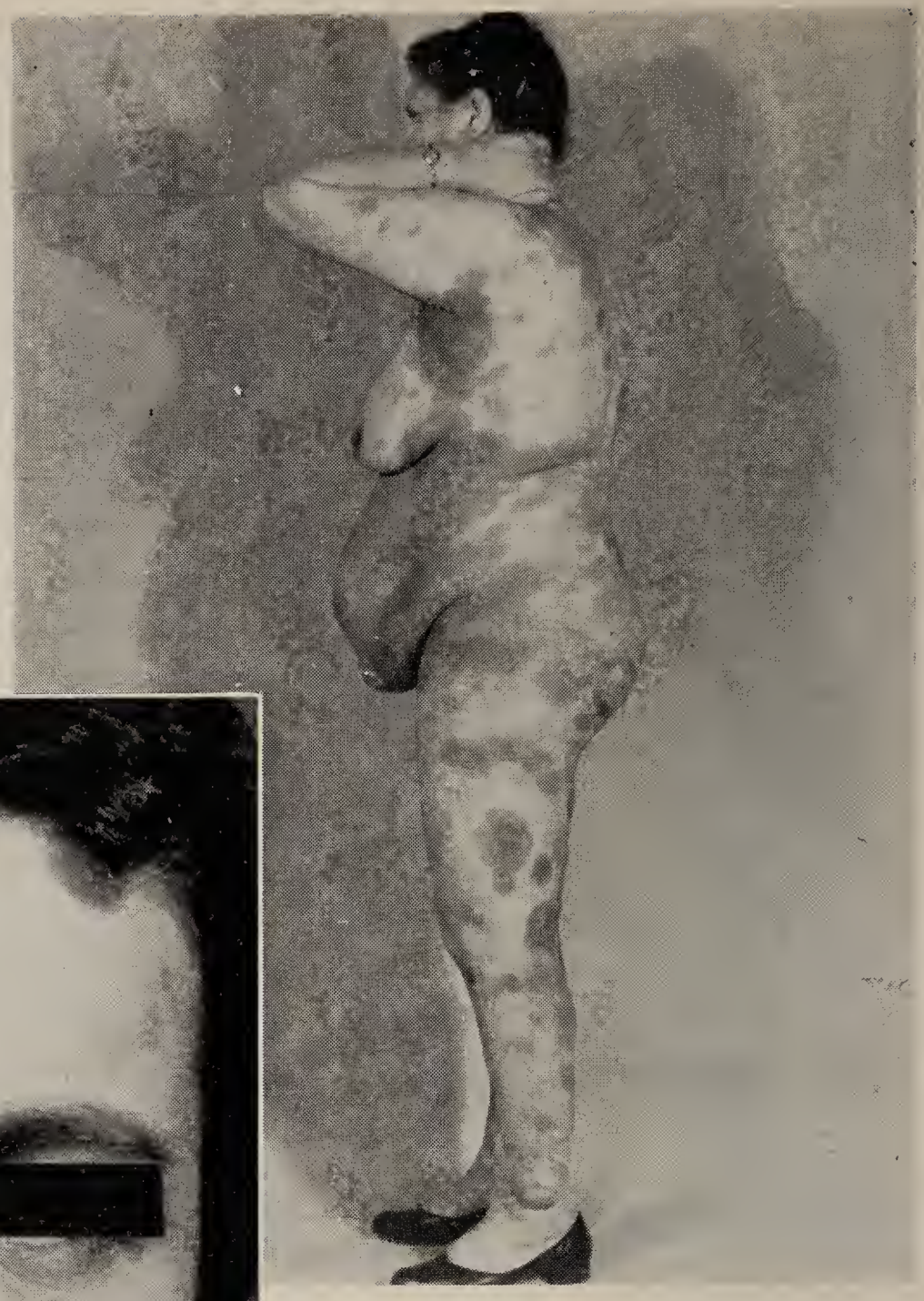

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FIGURE 1. This very itchy rash had progressed with no remissions from smooth erythematous patches to raised, rough, bright red plaques over a period of two years. Diagnosis? Treatment?

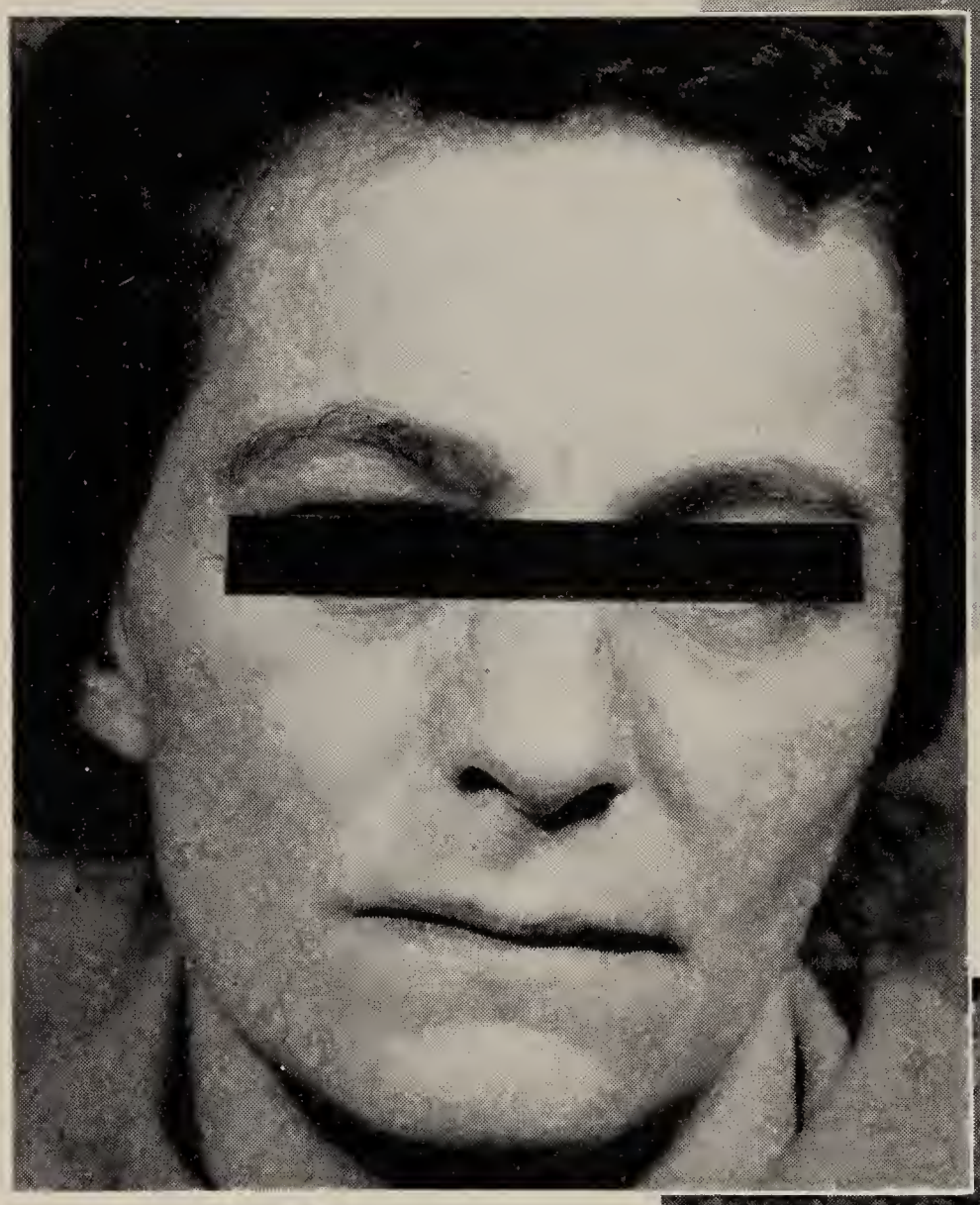

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FIGURE 2. These atraumatic scars developed over a period of 4 years. What disease has scarred this woman? Will she be free from systemic involvement?

→

FIGURE 3. This tense, red, painful, swollen metatarso-phalangeal joint came on suddenly following trivial trauma. What is your differential diagnosis? Provisional diagnosis? Treatment?

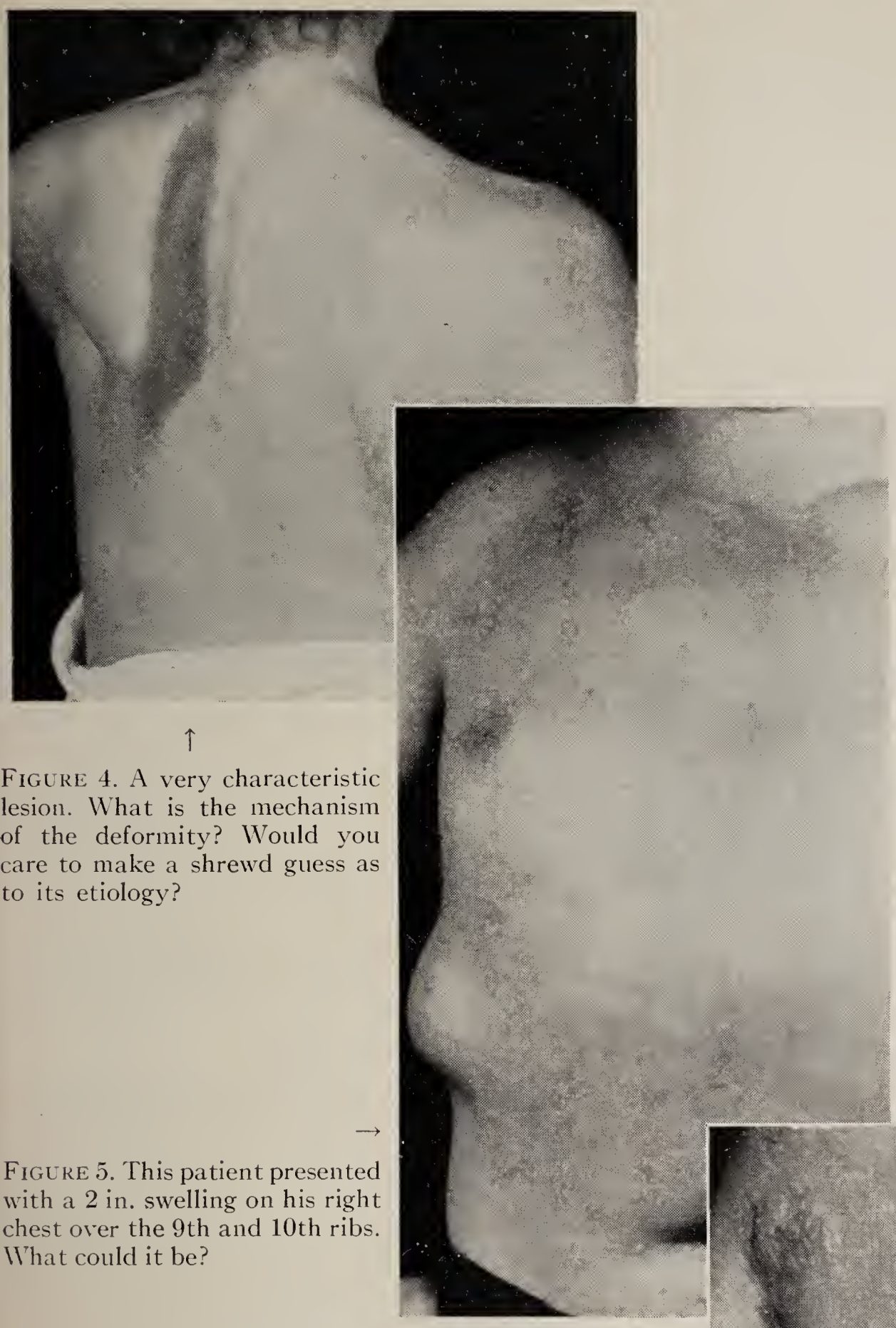

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FIGURE 4. A very characteristic lesion. What is the mechanism of the deformity? Would you care to make a shrewd guess as to its etiology?

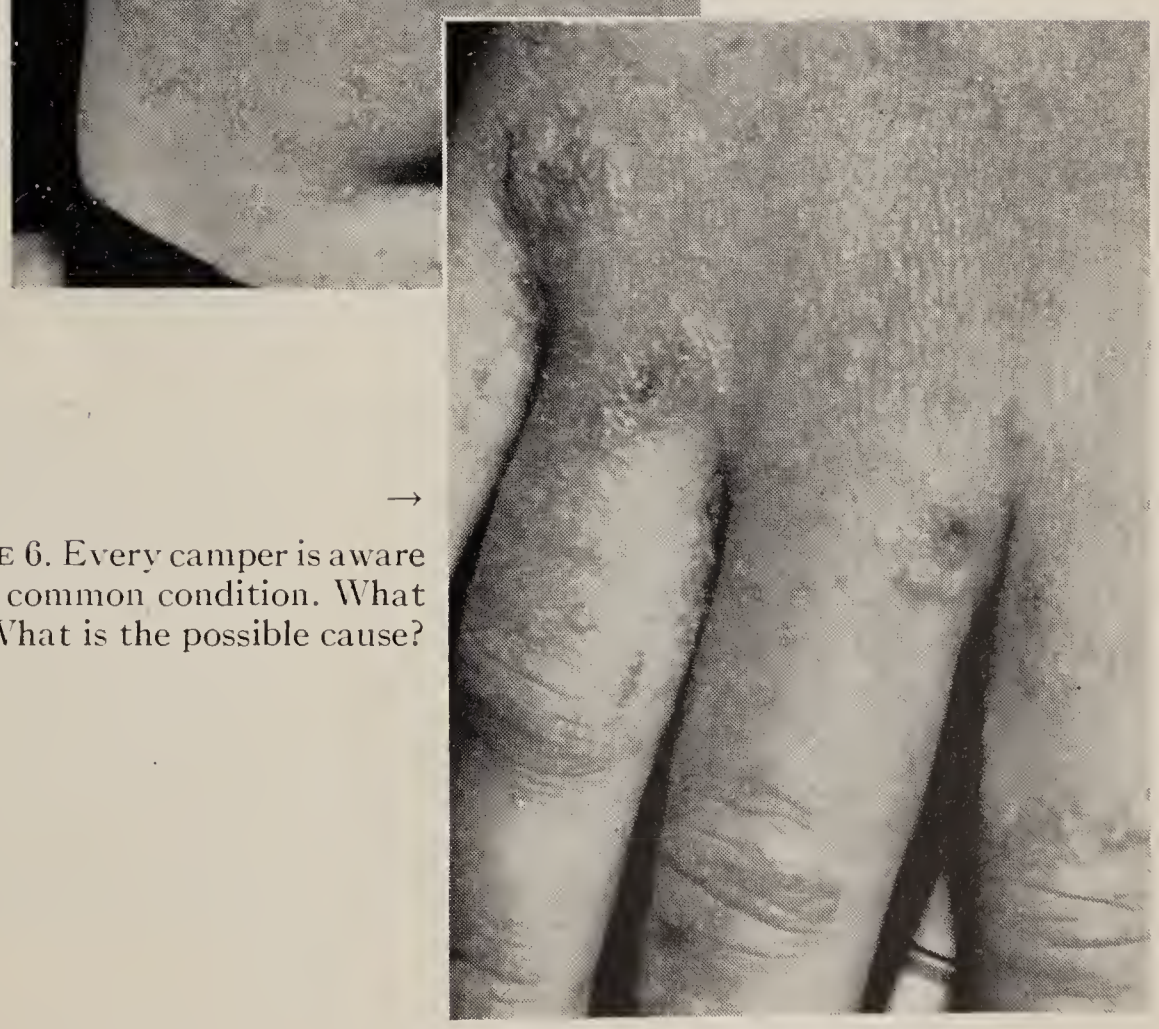

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FIGURE 5. This patient presented with a 2 in. swelling on his right chest over the 9th and 10th ribs. What could it be?

→

FIGURE 6. Every camper is aware of this common condition. What is it? What is the possible cause?

SURGICAL TREATMENT OF HEART DISEASE

I. G. YABLON, 5T8

Introduction

CARDIAC surgery is directed toward the correction of anomalies and disorders situated both inside and outside the heart. In general, those anomalies and disorders situated outside the heart were able to be treated successfully. The intracardiac lesions were treated by blind surgical procedures and by finger instrumentation. The disorders not amenable to curative procedures have required the development of safe and effective methods which are now available and in daily use for working within the chambers of the open heart. Thus, while the older methods are still in use, and are being successfully employed, Open Heart Surgery seems to offer the ultimate solution to the correction of many of the complex conditions heretofore considered inoperable.

Before discussing the surgical treatment of heart disease, a brief description of these recent developments will be given.

GENERAL HYPOTHERMIA

The principle of this procedure is to lower the body temperature so that the metabolism and oxygen consumption are sufficiently reduced to allow, quite safely, the complete occlusion of the heart from the systemic circulation.

The cooling effect is achieved by placing the patient in a tub of ice water at about three degrees centigrade. An alternative method is to cool the patient in a specially designed refrigeration unit in which the refrigerant is pumped through pads encasing the patient. The patient is cooled so that his body temperature falls to about 28 degrees centigrade, but this will depend on the type of operation to be performed. When satisfactory hypothermia has been achieved, a transternal bilateral thoracotomy is done and the azygos vein, superior and inferior venae cavae are occluded. Thirty to forty-five seconds are allowed for the heart to empty and then the aorta, pulmonary, and coronary arteries are clamped. The heart is then opened and operative repair done under direct vision.

PUMP OXYGENATORS

This apparatus allows for a total cardiorespiratory bypass of the blood, and is used at normal body temperature. The basic structure consists of a venous pump, an oxygenator, and an arterial pump. With regard to the oxygenation of the blood, two systems have been used with success clinically.

1. The *Biological Oxygenator System* employs three different methods for oxygenating the blood.

(a) *Cross Circulation*:

This consists of uniting the circulation of a healthy donor with that of the patient.

(b) *Heterologous Lungs*:

The lungs are removed from a dog and made sterile. Blood from the patient is shunted through these lungs where it is oxygenated and is then returned to the patient.

(c) *The Reservoir System*:

This is used in the case of a child. Arterial blood is taken from a healthy donor, and is then used during operation as if it were coming from any other acceptable donor source.

2. The *Artificial Oxygenator System* employs three different methods as well.

(a) *Bubble Oxygenation*:

This consists of a simple disposable

unit where venous blood from the patient comes in contact with oxygen. As the oxygen is taken up, carbon dioxide is released through the usual physico-chemical reactions.

(b) *Film Oxygenation*:

Here red blood cells are exposed directly to oxygen by being spread in layers over a large surface.

(c) *Membrane Oxygenation*:

Oxygen and venous blood are exposed over a large surface separated by a suitable membrane, such as cellulose, which is permeable to oxygen and carbon dioxide.

The artificial oxygenators which have had the most extensive clinical application to date are the film and bubble types. They appear to offer reproducible and reliable methods for temporarily supplanting the functions of the human lung.

*** *** *** *** ***

The following is a brief discussion of those heart conditions satisfactorily amenable to surgery.

I. Trauma

PENETRATING WOUNDS

Gunshot and stab wounds are the most common. Injury is also sustained in war, homicidal and suicidal acts, rapid travel with its incidence of trauma, and by flying metal and glass.

The following regimen is recommended in the management of wounds of the heart:

(a) Positive pressure intravenous infusion is instituted. This is started with 5% glucose or plasma followed by blood. At the same time an intra-arterial cut-down is begun.

(b) Oxygen is administered by respirator. Positive pressure is used. The airway must be open.

(c) Sucking wounds of the chest should be closed by suture or pack. In the event of tension pneumothorax or pneumohemothorax aspiration of the chest is done. Obvious bleeding should be stopped.

(d) The pericardium should be aspirated. This is done with a 17-gauge needle inserted through the 4th left intercostal space. Patients not responding to aspiration may have associated serious injuries to the chest and abdomen.

(e) If there is evidence of increasing tamponade or bleeding, or if the patient relapses into shock, an immediate operation is necessary. The same is true if there is a dry or inadequate tap.

Operation consists of a transpleural thoracotomy at the fourth intercostal space. The pericardium is opened, care being taken to avoid the heart which may be pressed against the pericardium by the tamponade. The wound is sutured and the clots evacuated. The pericardium is partially closed. The chest is closed in an airtight manner, but an intrapleural catheter is retained for underwater drainage.

(f) Shock therapy is continued.

(g) Antibiotics and sometimes antithrombin therapy are indicated.

NON-PENETRATING WOUNDS

Treatment will depend on the degree of injury. Mild myocardial and pericardial contusions tend to heal spontaneously. The severe injuries may cause fatal arrhythmias, asystole, or tamponade. When the valves are involved, failure may ensue.

If the patient is in shock, pericardial tap is indicated to relieve tamponade. Electrical stimulation should be used if ventricular fibrillation occurs. Intracardiac injection of adrenalin may start the organ in cardiac standstill. Cardiac massage may start the heart, but generally is only temporarily successful. If the patient survives, management

should be the same as for coronary artery occlusion. Pronestyl or quinidine should be used in auricular fibrillation. If the patient survives the original lesion, but shows signs of tamponade or tends to relapse into shock, surgical repair of the injury should be considered.

II. Cardiac Compression

ACUTE

The treatment of acute compression was considered under penetrating wounds of the heart.

CHRONIC

This may be produced by fluid, scar tissue or tumours, and impairs the heart by impeding venous return and by decreasing the cardiac output. Treatment is directed at relieving the underlying cause.

The commonest cause of chronic compression is chronic constrictive pericarditis. This is relieved by pericardiectomy. The operation of choice consists of a complete midline mediastinotomy through the sternum which permits excellent visualization of both venae cavae, the right ventricle and most of the left ventricle. It is important to remove not only the thickened pericardium but also a sufficient quantity of the organized exudate to permit adequate release of the ventricles.

III. Congenital Anomalies

PATENT DUCTUS ARTERIOSUS

This is a shunt between the aorta and the pulmonary artery. If it remains patent, then a quantity of blood is diverted from the peripheral circulation to the pulmonary circulation. Cardiac hypertrophy and failure are the sequelae.

Treatment consists of closing the patent vessel. Three different approaches are used:

(a) Incision on the left side of the chest through the third interspace. (Gross' Method).

(b) Through the fourth left interspace. This approach is used in children.

(c) Fifth rib incision.

As in the approach, there are different operative procedures. The ductus may be ligated, ligated and sutured, or ligated and divided. The latter method seems to be the procedure of choice, but in general the method employed most safely depends on the surgeon's skill.

ABNORMAL AORTIC ARCH

The main abnormalities to consider are: right aortic arch, double aortic arch, and anomalous right subclavian artery. Indications for operation are dyspnea, cough, pain, and dysphagia due to pressure on adjacent structures.

Right Aortic Arch: The carotid or subclavian vessels coming off this arch may be the cause of symptoms. The offending vessel can then be ligated, transfixed, and divided. It can be displaced and sutured to some contiguous structure to maintain displacement after division.

Double Aortic Arch: The arch carrying the lesser amount of blood should be divided and the two ends closed.

Anomalous Right Subclavian Artery: This should be resected. A good collateral circulation develops. This procedure is quite successful.

COARCTATION OF THE AORTA

Two forms of coarctation are recognized:

(a) The infantile type when there exists such a great degree of narrowing of the distal portion of the aorta that death occurs very early in life.

(b) The adult type where the narrowing is not as great as in the former type. Here sufficient blood passes the block for the patient to live, but despite this fact, 60–74% of these patients will be dead by the age of forty.

Three types of operation are available. The more common procedure consists of resecting the narrowed portion of the

aorta followed by an end to end anastomosis of the remaining parts. It is recommended that in freeing the aorta around the coarctation, the collateral circulation should be disturbed as little as possible. In the adult, continuous sutures are used whereas interrupted sutures are preferred in the younger patient so that the anastomosis may grow as the patient grows.

When it is impossible to bridge the gap by anastomosis after excision of the coarctation, two other methods are used. The Blalock Procedure consists of excising the coarctation and suturing the proximal end. The left subclavian artery is then cut across proximal to its initial branching, and is anastomosed with the distal end of the aorta. Another method is to excise the coarctation, bridging the gap thus formed by preserved aorta homografts. The results are quite satisfactory, but when the operation is performed in the very young the mortality is high. The optimum time to operate is between the ages of six and eighteen years when the aorta is more elastic and less sclerotic.

(c) *Gross Procedure*

This is an open type operation. A rubber well is sewn over the auricle and this chamber is opened. The well attachment is made liquid-tight and the blood therein kept fluid by an anticoagulant. Small defects are sutured directly under the blood level. Larger ones are closed by a polyethylene button. Kirklin and co-workers reported a very successful clinical series in 1955 placing the polyvinyl sponge by means of the Gross well.

(d) *Sondergaard Procedure*

A large suture is passed through the upper edge of the ventricular septum or the lower portion of the atrial septum, and then tied down in a previously developed plane between the right pulmonary veins and the posterior aspect of the right atrium thus squeezing closed the entire atrial septum.

(e) *Lillehei Procedure*

Here the Bubble Oxygenator utilizes the technique of extracorporeal circulation. The defect is repaired by appropriate means under direct vision.

INTERATRIAL SEPTAL DEFECTS

These may consist of:

(1) Patent foramen ovale
(2) Persistent ostium primum
(3) Foramen secundum
(4) Atrioventricularis communis
(5) Complete absence of the septum

Methods of treatment:

(a) *Atrioseptopexy (Bailey)*

This operation is used in the secundum type defect. It consists of invaginating the atrial wall into the defect and suturing it to the rim of the defect.

(b) *Swan Technique*

This is done under hypothermia. The atrium is opened, and the defect is repaired with silk suture under direct vision.

TETRALOGY OF FALLOT

The Tetralogy of Fallot is characterized by pulmonary or infundibular stenosis, an interventricular septal defect, an overriding aorta, and hypertrophy of the right ventricle. Here, two physiological disturbances occur. One consists of the mixture of oxygenated and unoxygenated blood which is delivered to the peripheral circulation due to the overriding aorta. The other is due to the stenosis of the pulmonary artery which prevents adequate blood from flowing into the lungs thereby causing systemic anoxemia.

Three procedures are used with regard to treatment: the recircuiting, the valvulotomy operations, and the Open Heart Technique.

Recircuiting Procedures:

Blalock constructs an artificial ductus by dividing and ligating the right subclavian artery at the point where it gives off its first large branch. The distal end of this artery is then anastomosed to the side of the pulmonary artery.

Potts makes the shunt between the left pulmonary artery and thoracic aorta while Holmann anastomoses the left subclavian artery to the pulmonary artery. The principle is the same in each case.

Valvulotomy Procedures:

The recircuiting operations have their disadvantages. The pulmonary obstruction remains, and an artificial ductus is added to an already abnormal heart.

This technique, pioneered by Brock, provides a direct attack upon the stenosed valve or infundibulum. The approach is through the right ventricle. A valvulotome (special type of scalpel) is then used to cut the valve. The opening is then dilated by sounds and clamps.

If the case in point is one of infundibular stenosis, a punch is used to bite out a bit of the muscular diaphragm causing the stenosis.

Open Heart Technique:

Lillehei and his associates are treating this anomaly by open cardiotomy using a pump oxygenator. In this way it is possible to correct all existing cardiac defects. By restoring the circulation to normal anatomically and physiologically, it is felt that life expectancy can be lengthened to its full span. The results thus far are extremely promising.

IV. Acquired Heart Disease

Mitral Stenosis

Commissurotomy is the name given to the operation on the mitral valve. Its purpose is to divide the commissures in the line of their anatomic formation at the site of their fusion.

Selection of Patients for Operation:

1. *Most Satisfactory Prognosis*:
   - (a) Age less than fifty.
   - (b) No active Rheumatic Heart Disease.
   - (c) Adequate response to exercise test.
   - (d) Normal sinus rhythm.
   - (e) Out of cardiac failure.
   - (f) Lesion purely or predominantly stenosis.
   - (g) No embolic or cerebral vascular phenomena.

2. *Less Satisfactory Prognosis*:
   - (a) Age less than sixty.
   - (b) More than one attack of heart failure.
   - (c) Only fair response to exercise tolerance test.
   - (d) Auricular fibrillation with mild systolic murmur.
   - (e) Left auricle and pulmonary vessels markedly dilated.
   - (f) ECG shows myocardial damage.

3. *Contraindicated*:
   - (a) Debilitation and advanced age.
   - (b) Heart failure which cannot be controlled.
   - (c) Presence of subacute bacterial endocarditis.
   - (d) Multivalvular disease which is disabling.
   - (e) Severe degree of mitral regurgitation.

Procedure

The incision is made through the left lateral chest wall in the fourth or fifth interspace. This incision presents the left auricular appendage which may herniate through the wound. The valve is approached through this appendage. A purse string suture is placed about its base. If a thrombus is present, the appendage is amputated.

Now that the approach to the valve has been established there are three methods by which the operation may be performed.

(a) *Simple Finger Fracture (Valvuloplasty)*:

The finger is inserted through the auricular appendage up to the valve. The status of the valve as to stenosis, arteriosclerosis, and regurgitation is determined. Division of the valve is then attempted with the finger.

(b) *Mechanical Fracture*:

Here the opening of the valve should be fish-mouthed with elastic edges. Special instruments which are designed to follow the curvature of the index finger are used to forcibly break the commissures, especially in sclerotic cases.

(c) *Incision at the Commissures:*

This is done with a valvulotome which is modelled and fits the index finger, and is used to incise the valve. It is particularly useful where calcification of the valve occurs.

Prognosis

The results are quite successful. The overall mortality is about 3% to 5%. Patients falling into the category between group 2 and the contraindicated cases (see Selection of Patients for Operation) will have a mortality of about 10% to 20%.

In Bailey's series of three hundred such operations, 75% of the patients were markedly improved post operatively, and 15% received moderate relief.

Conclusion

There are still many unsolved problems in the field of cardiovascular surgery. Their solution must await advancement in knowledge and technique. However, the development of this field thus far, leaves no doubt that the near future will see the solution of these problems.

Acknowledgement

The author is indebted to Dr. W. G. Bigelow for the time given to reading the manuscript and for his many helpful suggestions.

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AVIATION MEDICINE

W. A. CUMMING, 5T8

THE medical undergraduate has little time to investigate the specialized aspects of medicine that are not presented to him in his course of study. The purpose of this article is to acquaint the reader with one of the newer specialities, one which is scarcely mentioned in any undergraduate course.

Although it is only in the last twenty years that Aviation Medicine has been intensely studied, the first flying physician became airborne in 1784. This doctor was John Jeffries who ascended in a hydrogen-filled balloon to investigate the possibilities of balloon flight as well as to gather data on atmospheric conditions and temperatures at high altitudes. He reached a height of over 9,000 feet, and recorded the results of his ascents in a report presented to the

Royal Society. Dr. Jeffries, as a physician and an experimenting scientist, was the first Aviation Medicine specialist.

Nineteen hundred and three saw the first airplane take to the air, and heralded the beginning of the aviation age with all the problems it would present to the science of medicine. Not until World War I was flying done on a large scale. Simultaneously, the need for more knowledge about the human body's capabilities with regard to flying became apparent. A high accident rate during the training of military pilots prompted the adoption of medical standards and methods of examination for flying personnel.

The problems encountered by the pioneers in Aviation Medicine were much the same as those of today. They found that pilots lost their "flying nerve" after long periods of flying, particularly when the stress of combat was added to the stress of flying. The symptoms of this condition, now known as "operational fatigue", were loss of confidence in the aviator's self or in his machine, insomnia, tremor, gastro-intestinal upsets and tachycardia. The first Air Force doctors served a valuable role by spotting the first signs of operational fatigue and arranging a temporary cessation of flying. In this way pilots could be rested and returned to flying duties whereas if allowed to develop a full-blown picture of operational fatigue, they might never fly again, or might be involved in a tragic accident.

Oxygen supply for flying at high altitudes was gradually recognized as a necessity. Most flying in World War I was done at altitudes below 20,000 feet so that chronic anoxia developed. In this condition the flier rarely became unconscious but instead suffered a loss of judgment and slowing of reflex actions. The need for efficient and comfortable oxygen masks became apparent as aircrew refused to wear the unwieldy apparatus first devised. The oxygen problem has not been fully solved even today when the need is greater because of higher altitudes. Oxygen storage is space consuming in aircraft where space is hard to find. Masks are uncomfortable and tubing is cumbersome and may become disconnected. These are all problems of interest to today's Aviation Medicine doctor.

Temperature was a major problem to the World War I aviator in his open aircraft. Protective clothing hindered his vision and his movements, while the combination of cold and low oxygen tension provided a double stress. If we imagine a pilot trying to fly under the combined strain of anoxia, severe cold, and operational fatigue, it is obvious that his efficiency would be greatly reduced, probably to the point of danger. Temperature is still a problem although the newest aircraft have made it one of cooling rather than heating.

Between the two wars, aircraft performance increased so that all earlier problems were magnified. As higher altitudes were reached, oxygen equipment became more complicated. With the increased performance came the need for higher standards of aircrew selection. World War II brought about rapid improvement in aircraft so that all countries were forced to enter Aviation Medicine research in order to provide their high performance aircraft with equally high performance crews. This research dealt with the same problems that had arisen in World War I with the added ones of "G" forces, psychological factors peculiar to aircrew and an increased interest in escape from aircraft and survival on the ground. In general the field of Aviation Medicine concerned itself with the physiology of flying and with protection of aircrew against the hazards associated with flying.

In working along these lines the

doctor finds that he has to be something of a physicist to know the physics of the atmosphere and forces of acceleration, an aeronautical engineer to recommend structural changes in aircraft design, a physiologist, a psychiatrist, and a psychologist. He also has to be a teacher if he is to convey his recommendations to the flier who will put them to work. The flier must be trained to use his oxygen and safety equipment and to have complete faith in it.

Since World War II, aircraft design has advanced rapidly, bringing special problems of supersonic flight and extremely high altitude. We are on the threshold of flight outside our own atmosphere, and no one knows how we will make our satellites and space ships into safe carriers of men. This will be the role of aviation medicine in conquering outer space.

In Canada, the R.C.A.F. carries on its Aviation Medicine research at the Institute of Aviation Medicine in Toronto. Here air force and civilian doctors are dealing with oxygen equipment, survival equipment, escape methods, problems of changing pressure at altitude, motion sickness, acceleration, protective clothing, and the determination of man's fitness to fly.

These subjects are investigated by various means. The decompression chamber which can be evacuated by pumps provides a means of simulating altitudes which are encountered by our aircraft. In the chamber, oxygen equipment can be evaluated and tested; aircrew can be taught to use their equipment; and an individual's reaction to altitude can be assessed. Forces of acceleration can be studied with the accelerator, a rotation cockpit which reproduces the tight turns and resultant "G" forces occurring in flight. A pilot's ability to withstand "G" can be estimated in such a machine. Various suits designed to counteract the effect of "G" on the pilot's cardiovascular system can be tested here also. Motion sickness is studied on various devices which reproduce movements occurring in aircraft manoeuvres. Hot rooms and cold rooms can be used to test protective clothing and survival equipment such as sleeping bags which must be small enough to fit into a fighter pilot's seat pack. A copper man can wear heating or cooling clothing and give accurate readings of temperature changes occurring inside the clothing while the outside is subjected to extremes of temperature.

This type of research requires extensive equipment because the environment found in a flying aircraft must be reproduced in a ground laboratory. The personnel engaged in such work require a knowledge of flying, of physiology and of physics as well as an interest in the future of flight and the welfare of fliers.

Some people may like to point out that the pilot will soon be taken from our aircraft to be replaced by an electronic device. Will this make Aviation Medicine an unneeded science? Not at all. Aircraft will continue to be an important means of transportation, and the comfort and safety of aircraft passengers are as important as those of the pilot and crew. Even if the operation of the machine is done by mechanical devices, the passengers must be assured of safety. Flight outside our atmosphere will be of limited value until man can go along for the ride, and Aviation Medicine will have to keep pace with the engineering progress that will make such flights possible.

Aviation Medicine today is a certifiable specialty and one offering a broad scope to the doctor with a liking for research. He is far removed from the clinic and devotes his energies to the research laboratory and the aircraft. He can contribute to the safety of our military aircrew and of civilian aircrew and passengers, while helping to make

the first trip to the moon a practical reality.

This field of medicine is of tremendous importance in these days of rapid transportation by air, of satellites and rockets to the moon. Anyone who is so inclined may investigate further by using the many books and periodicals devoted to Aviation Medicine.

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CASE REPORT: RUPTURED ECTOPIC PREGNANCY

R. D. SHORTREED, 5T8

MRS. D. G., a 28 year old Para O Gravida 1, separated waitress, was admitted November 6, 1957 with the chief complaint of lower abdominal pain and irregular vaginal bleeding.

History of Present Illness

The patient had no subjective symptoms of pregnancy. Her last menstrual period was October 10, 1957. The period came seven days early, lasted seven days, and bleeding was heavier than normal.

The following chronological progression took place:

October 20—one day of spotting.

October 30—two days of spotting.

November 2—lower abdominal pain, dull in character and continuous, not related to bladder or bowel function. No radiation to shoulder tip, but seemed worse on the left side.

November 3 — passed dark blood vaginally. Pain continued as above.

November 5—bleeding from vagina described by the patient as a normal period. Bleeding was moderately heavy, requiring six pads. The pain became worse, being steady, dull in character, more marked in the left lower quadrant and accentuated by moving about.

Past History

April 1956—a miscarriage at three months of pregnancy was treated by a D and C.

May 1957—patient had had an episode similar to the present illness with left lower quadrant pain for two days. She was admitted from Emergency as a possible ectopic, but due to improvement in her general condition, a negative A–Z test, and the finding of a left adnexal mass on pelvic examination a provisional diagnosis of pelvic inflammatory disease or ovarian cyst was made.

No previous illnesses or surgical procedures.

Physical Examination

The patient was a well developed, well-nourished, rather pale woman who appeared apprehensive and ill.

General physical findings were limited to the cardiovascular system and the abdomen. Blood pressure was 100/65. Heart rhythm was regular with a soft Grade I systolic aortic murmur.

Abdominal examination revealed generalized lower abdominal tenderness, more marked on the left side, and rebound tenderness. Liver, spleen, and kidneys were not palpable. The uterus was not palpable abdominally. There was no costovertebral tenderness. Bowel sounds were normal.

Pelvic Examination

This revealed a normal marital introitus with a slight bloody discharge. Cervix was nulliparous. The uterus was

enlarged to the size of a six week pregnancy. The following morning abdominal splinting made it difficult to delineate the uterus. At this time, there was exquisite tenderness on moving the cervix, which had not been reported at the time of admission.

Laboratory Findings

Hgb. 66%.

W.B.C. 22,000—November 6.
11,500—November 7.

Urine—negative for sugar and albumin; slight trace of ketones. Microscopically, there were 3 to 5 W.B.C.'s per h.p.f., with no R.B.C.'s or casts.

A–Z test—positive.

Operative Procedure

On the basis of this history and clinical findings, the patient, after being given blood, was taken to the operating room where she was placed in the lithotomy position, prepared and draped A posterior colpotomy, using the scissor technique rather than needle puncture, was performed and dark blood was found in the pouch of Douglas.

Without further delay the patient was placed supine, and her abdomen prepared and draped. A transverse skin incision was made midway between the umbilicus and symphysis pubis, and the right rectus sheath was opened vertically. The peritoneal cavity was exposed and 300 cc. of clotted dark blood were removed.

The left adnexae were covered with filmy adhesions.

The right tube was grossly distorted in the distal two centimetres. The ostial end of the tube was opened from which the products of conception had aborted. Filmy adhesions were present over the right tube also.

A right salpingectomy was performed and the bleeding controlled. The patient was returned to the ward in good condition.

Pathology

Grossly, the specimen measured 9 cm. x 1 cm. and was perforated at one end. The internal surface was haemorrhagic and a cyst 2 cm. x 1.5 cm. was present within the tube.

Multiple sections of the specimen revealed a blood clot attached to the epithelial lining of the tube and within this clot, one or two small chorionic villi could be identified. There was haemorrhage and marked edema of the wall of the tube.

Differential Diagnosis

Conditions most commonly confused with a ruptured ectopic pregnancy are as follows:

A. THOSE ARISING IN THE FEMALE GENITAL TRACT

(i) *Threatened or incomplete abortion*

External haemorrhage is profuse and red in colour. Shock is in proportion to visible blood loss. The pain is usually secondary and in the midline rather than generalized lower abdominal pain in either or both quadrants. The cervix may be dilated and lacks the quality of "exquisite tenderness" on moving. The uterus is enlarged proportional to the period of amenorrhea.

(ii) *Pelvic Inflammatory Disease*

There is often a history of similar attacks. Usually there is no amenorrhea; menorrhagia is the rule, whereas spotting is more common with ruptured ectopics. Pain and tenderness are usually bilateral. On pelvic examination, both adnexae may be thickened. Temperature usually exceeds 101°F. The W.B.C. is higher and sedimentation rate is increased.

(iii) *Torsion of ovarian cyst*

The signs and symptoms of pregnancy are not encountered. Rarely is there vaginal bleeding. Pelvic mass is usually discreet and ovoid, whereas a ruptured ectopic is ill defined.

(iv) *Rupture of follicular cyst or corpus luteum cyst*

With bleeding into the peritoneal cavity, the condition is indistinguishable from a ruptured ectopic.

(v) *Mid-cyclic Bleeding*

Spotting and lower abdominal pain are similar, but the relation to the normal period is generally constant and symptoms of pregnancy are not found.

B. THOSE ARISING OUTSIDE THE FEMALE GENITAL TRACT

(i) *Acute Appendicitis*

There is no mass on vaginal examination. Tenderness is less and is localized higher over McBurney's point.

(ii) Other causes of the acute abdomen, such as rupture of viscus or bowel obstruction, should be ruled out.

(iii) Rupture of some part of the arterial tree may also have to be considered.

CONCLUSION

The diagnosis of ruptured ectopic pregnancy depends on remembering that any woman within the child bearing age complaining of lower abdominal pain could be suffering from this condition. The most important factor is a careful accurate history relating to menstruation, type of irregular bleeding, character of blood, symptoms of pregnancy and quality, intensity and location of pain. As seen in this case, the picture may be coloured by lack of factors and previous history of suspected pelvic inflammatory disease, so that diagnosis may at times be more difficult than classical textbook descriptions would allow the student to think.

ANSWERS TO "ON INSPECTION"

B. M. STEWART, 5T8

FIGURE 1.

THE diagnosis of mycosis fungoides was confirmed by a skin biopsy which showed a dermal infiltration of reticulum cells, polymorphonuclear leukocytes and eosinophiles.

This skin condition is rare, and frequently terminates as one of the lymphomas. Sometimes the condition responds to X-ray, nitrogen mustard, or triethylmelanine treatment. There is, however, no specific therapy.

FIGURE 2.

The lesion is that of chronic discoid lupus erythematosus. The pattern of scarring on the face is seen much more often than the full blown classic butterfly scar of Hebra, spreading over the nose and flaring on the cheeks. Constitutional symptoms are rare in the chronic discoid type except for an occasional instance of leucopenia. Occasionally arthralgia may be present. The development of systemic manifestations, however, is often indicative of dissemination of the disease.

FIGURE 3.

The differential diagnosis includes gout, acute rheumatic fever, rheumatoid arthritis, osteoarthritis, gonorrheal arthritis and acute cellulitis. Gout need be the only consideration if the serum uric

acid is elevated to about 8 mgm./100 ml. from a normal of 2–5 mgm./100 ml. and if there is rapid relief of pain and swelling after colchicine treatment. This patient had acute gout.

Oral colchicine is still the best drug in the acute episode. It is important to commence therapy immediately. Dr. John Talbott recommends 1 mgm. every two hours until gastrointestinal symptoms develop. Normally 8–14 mgm. are necessary. Stop the colchicine when gastrointestinal symptoms become too irritating. If a second course is needed, it should be withheld 48 hours. Intravenous colchicine has no advantage over the oral type. ACTH, prednisone and butazolidine have all been used with good results in acute gout resistant to colchicine therapy.

Direct attack upon the acute gouty joint is unnecessary except in the case of acute effusion of the knee. In such cases aspiration and instillation of 50 mgm. of hydrocortisone constitute the treatment.

Reference: Conn: Current Therapy, 1957.

Figure 4.

Paralysis of the serratus anterior muscle gives the "winged scapula" deformity. This muscle arises from the outer surface of the upper eight ribs, and is inserted into the costal aspect of the medial border of the scapula. It rotates the angle of the scapula forward when the arm is raised, and pulls the whole scapula forward to increase the reach of the arm. This movement is balanced by the rhomboids which keep the scapula applied to the chest wall. If either of these muscles are paralysed a "winged scapula" results.

In this patient the long thoracic nerve to the serratus anterior ($C_{5, 6, 7}$) was inadvertently cut during a radical mastectomy.

Figure 5.

When the swelling was palpated, it proved to be very soft and reduced easily allowing one to outline a triangular defect in the thoracic wall. The patient gave a history of traumatic fracture of the right 9th and 10th ribs four weeks previously which was treated by adhesive strapping. When the support was removed this swelling appeared. The defect was produced by scarring and fibrosis of the peri-fracture area with contracture which pulled the two fragments of the 9th rib down, leaving the hole through which the hepatic flexure of the colon evaginated.

Figure 6.

This is a classic example of dermatitis venenata or contact dermatitis. The skin reacts to injury depending upon the degree of stimulus presented to it. Here the stimulus was marked, and all the typical lesions of a dermatitis are nicely shown—erythema, edema, vesiculation, oozing and crusting associated with itching and burning.

This case was one of poison ivy, but several other plants can produce the same picture (poison oak, poison sumac, chrysanthemum, primrose, marsh elder, and small and giant ragweed). Persons exposed to chemicals may develop contact dermatitis. Common offenders are porphenylendiamine in hair dyes, aniline dyes, azo dyes, some perfumes, mercurial compounds, resorcin, quinine, plastics and detergents.

Blond and dry senile skin is usually more susceptible. Environmental conditions such as heat, friction, moisture and exposure to organic solvents and keratolytic chemicals are known to be predisposing factors.

Diagnosis is made when an acute dermatitis appears on regions of the body readily exposed to outside irritants usually after contact with some irritating

substance. Inflammation is limited to the contact areas initially, but may spread beyond in the most acute phase.

Treatment consists of any one of zinc oxide and aqua calcis lotion, calamine lotion, solutions of sugar of lead or oleated limewater.

In the case of poison ivy the surface should be thoroughly cleansed with soapsuds followed by an alcohol rub.

ACKNOWLEDGEMENT

Our thanks to Mr. Arthur Smialowski, photographer at St. Michael's Hospital and Mr. Frank Athran of the Photography Dept., Toronto General Hospital, for their interest and their photographs.

ABSTRACTS

R. F. ARMSTRONG, 5T9

Present Status of Poliomyelitis Vaccination: R. D. Defries, Canadian Medical Association Journal, **77**: 663, 1957.

Since its discovery over four years ago by Dr. Jonas Salk, poliomyelitis vaccine has been given extensive field trials and found to be safe and effective in reducing the incidence of paralytic poliomyelitis.

The vaccine is prepared by growing a strain of each of the three known types of polio virus separately in a monkey kidney tissue culture. After being filtered and inactivated with formalin, it is pooled and the final vaccine which is clear and cherry red in colour is distributed in rubber-capped vials. During the whole process rigid tests ensure its antigenic value and safety.

It is recommended that three 1 cc. doses be given, the second four weeks following the first, and the third at least seven months later. Present evidence indicates that recall doses will be necessary after two or more years. Reactions are uncommon, and when they do occur are mild.

At present work is being done in an effort to obtain satisfactory live attenuated strains. An attempt is also being made to produce a polio virus with the characteristics of the three known types. The stability of a quadruple vaccine, combining the poliomyelitis vaccine with the present triple antigen of diphtheria, pertussis and tetanus, is now being determined.

Although the vaccine will protect against paralytic poliomyelitis, it does not prevent intestinal infection so that vaccinated persons may become carriers and infect unprotected individuals. For adequate control all persons under forty should be vaccinated. In Canada approximately 4,000,000 of these have received the vaccine, but it still must be made available to another 6,500,000 people.

Newer Concepts in Leukocyte Physiology and Their Clinical Significance: C. G. Craddock, S. Perry, and J. S. Lawrence, Archives of Internal Medicine, **100**: 183, 1957.

Quantitative investigation has revealed much information about the physiology of production and destruction of erythrocytes. However, until the present, little work had been done to similarly investigate leukocytes.

By using isotopic labelled DNA the life span of lymphocytes was calculated to be 100–300 days and myeloid leukocytes 13–20 days.

From animal experiments with labelled DNA and leukopheresis the following information has been obtained:

(1) The leukopenia is followed in an hour by a release of leukocytes until in

four to eight hours the leukocyte count is well above the basal level.

(2) The chief reservoir of leukocytes in acute leukocytosis is the bone marrow. No response occurs if the marrow is destroyed by irradiation.

(3) The intramedullary reserve of mature leukocytes is many times the number of circulating cells.

(4) The acceleration of production of leukocytes from hyperplasia of the marrow does not reach a maximum until five days.

(5) The height of the leukocyte response depends partly on the size of the intramedullary reserve.

Some of the clinical applications are:

(1) In X-ray therapy leukopenia indicates severe marrow damage. With chronic irradiation therapy, leukopenia is more easily produced.

(2) The number of circulating leukocytes depends upon a balance between the rate of production and loss. Excess loss with severe pyogenic infections will produce a leukopenia.

(3) Since the platelets are intermediate between the erythrocytes and the leukocytes in respect to the number in reserve, repeated haemorrhage can cause a thrombocytopenia.

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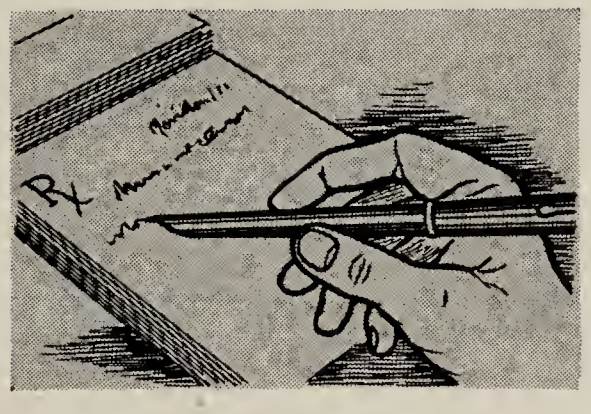

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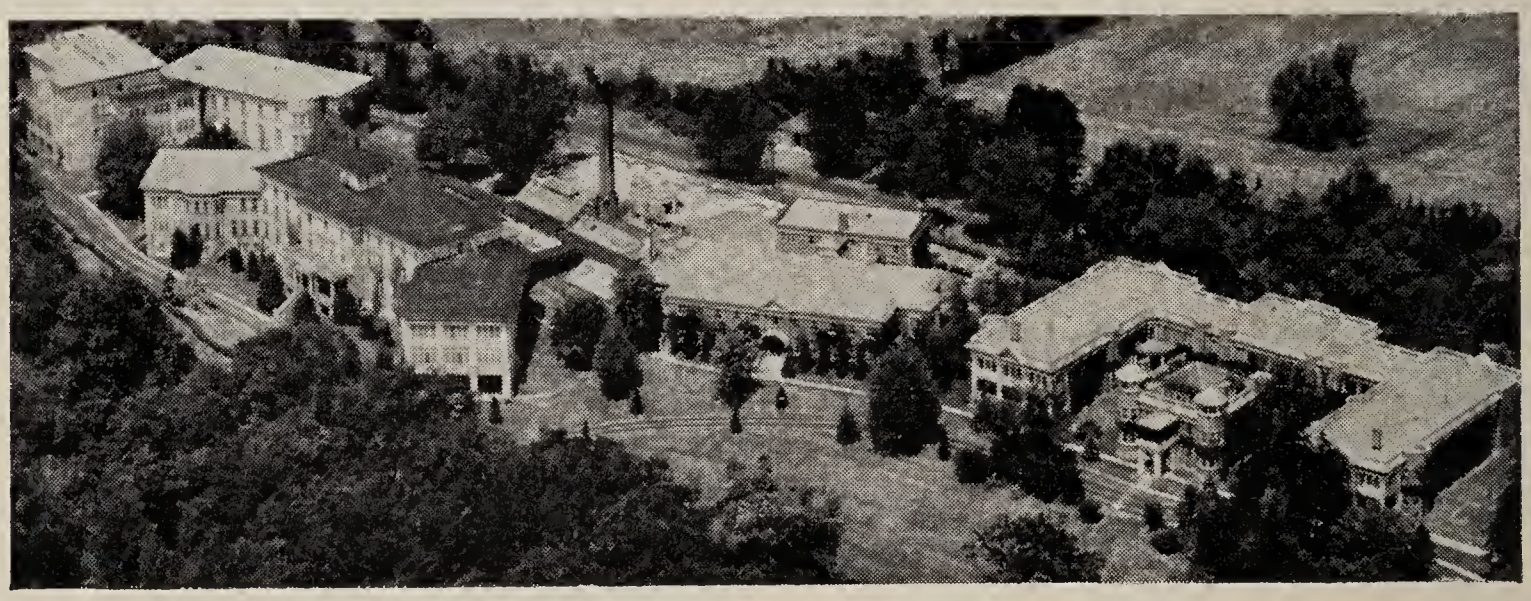

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[1]Nichola, R. L. and Finland, M.: J. Clin. Med. 49:410, 1957.

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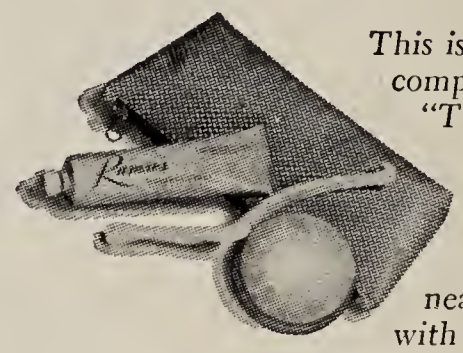

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References: 1. Dinkel, R. M.: Eugenics Quart. 3:22 (Mar.) 1956. 2. Grove, R. D.: Am. J. Pub. Health *46*:592 (May) 1956. 3. Novak, E., and Novak, E. R.: Textbook of Gynecology, Baltimore, The Williams & Wilkins Company, 1956. 4. Tietze, C.: Proc. 3rd Internat. Conf. Planned Parenthood, 1953.

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